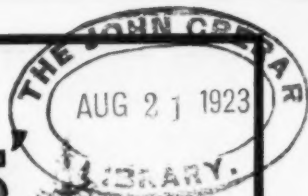
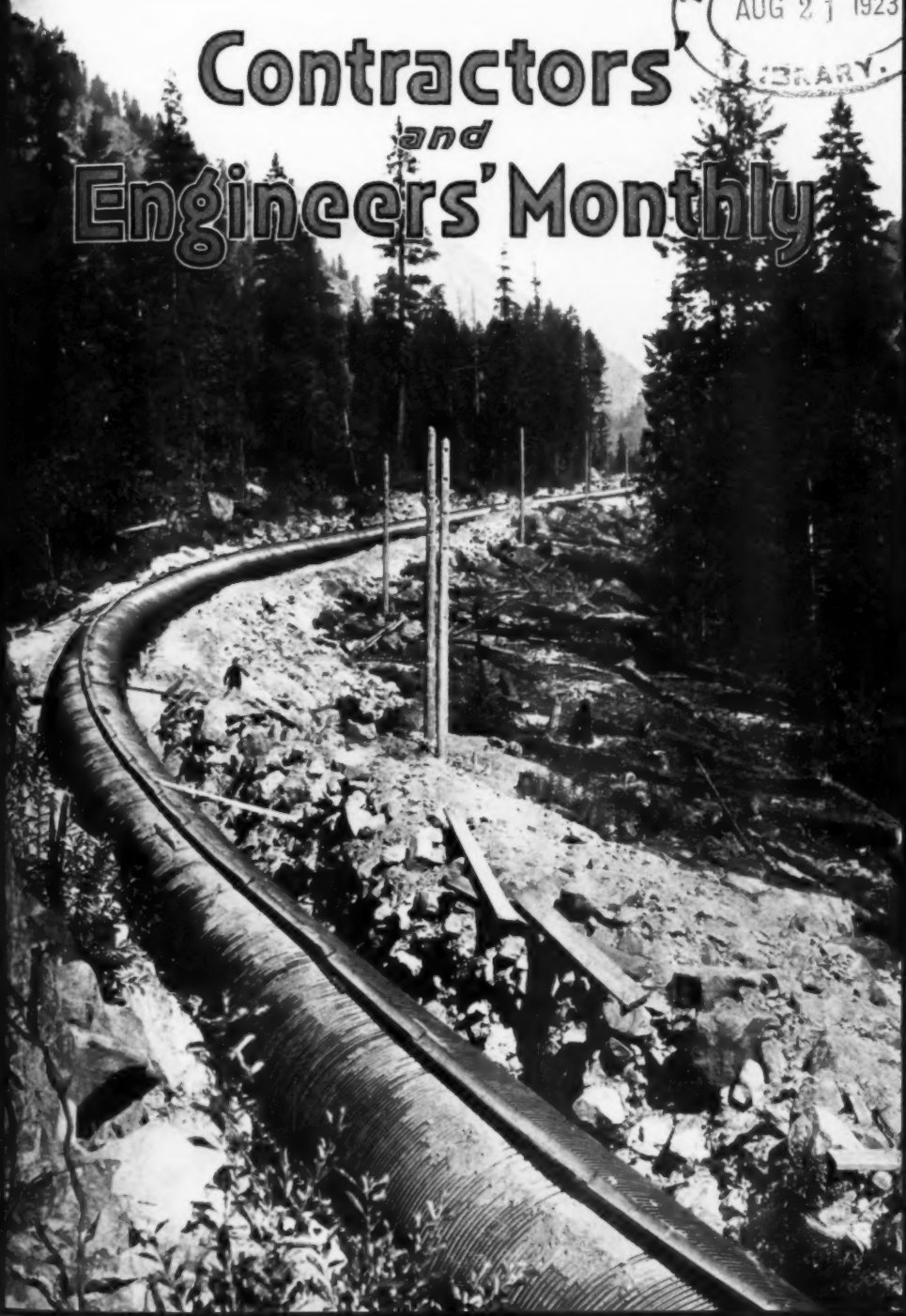


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Contractors *and* Engineers' Monthly



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VOL. VII. No. 2

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AUGUST, 1943

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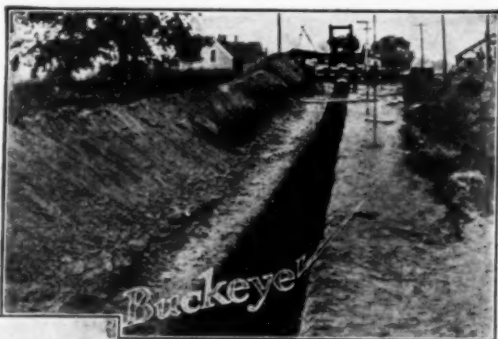
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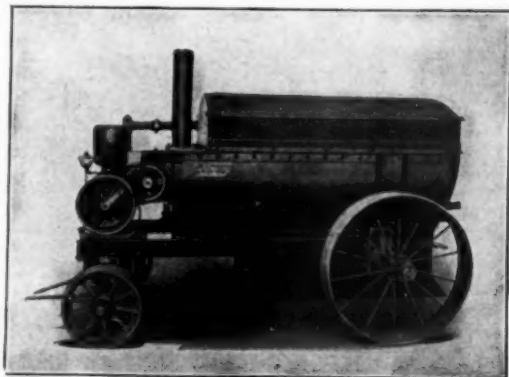


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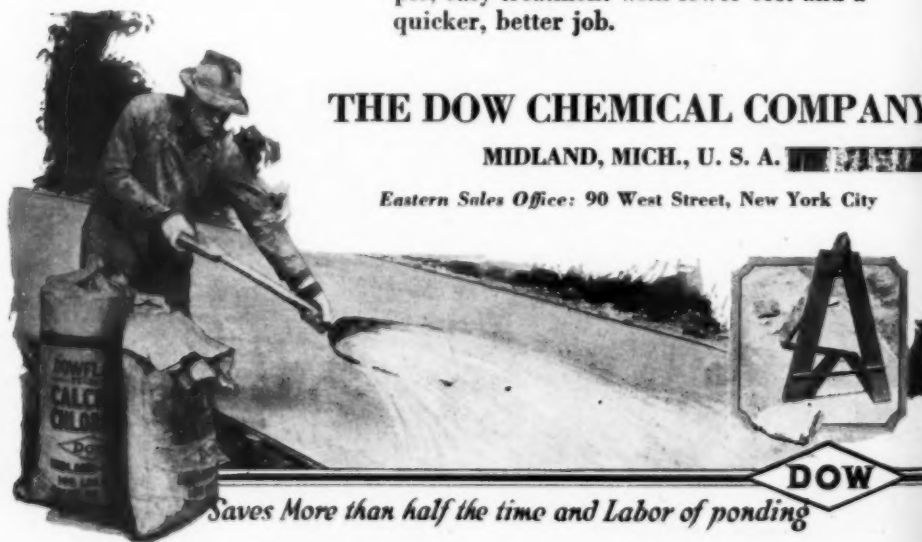
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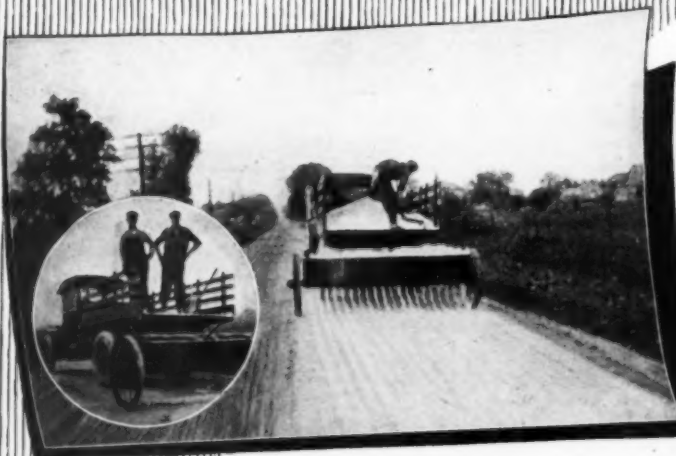
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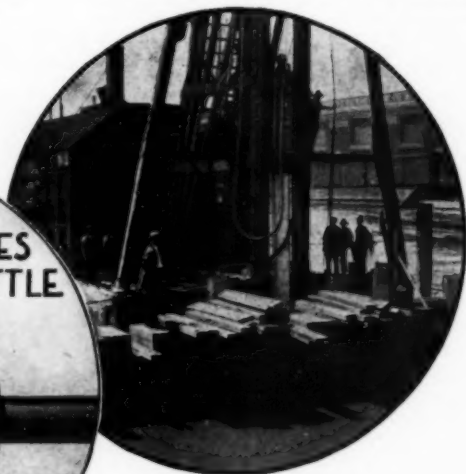
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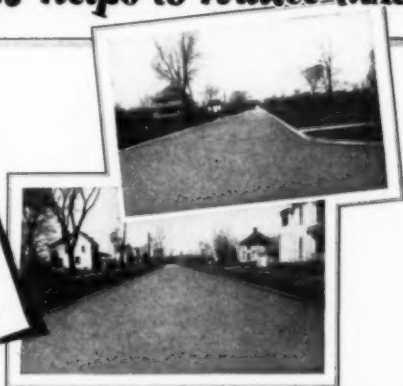
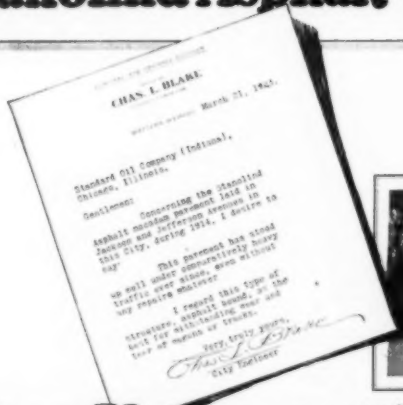
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Stanolind Asphalt-helps to reduce taxes



Nine Years *without* repairs!

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Therefore, as an indication of the way in which Stanolind Paving Asphalt has helped solve this problem for many, we print the above concise letter from Mr. Charles L. Blake, City Engineer, Watseka, Illinois, regarding one of the Stanolind Asphalt pavements under his jurisdiction.

Note that Mr. Blake states that this pavement has lasted nine years

under comparatively heavy traffic, without any necessity for repairs.

From the photographs which accompany the letter, it is evident that this street is in as good condition now as the day it was completed and will easily give another nine years of good service.

As Mr. Blake says, Stanolind Paving Asphalt is the best for withstanding the wear and tear of wagons and trucks. He is not alone in his judgment, because scores of other men in like capacity, stand ready to testify that Stanolind Paving Asphalt, laid at a low initial cost, noted for its freedom from repairs and its long life, is the ideal road-building material.

We have recently issued a booklet which tells the latest methods of constructing and maintaining bituminous pavements. It will be sent to you free, upon request.

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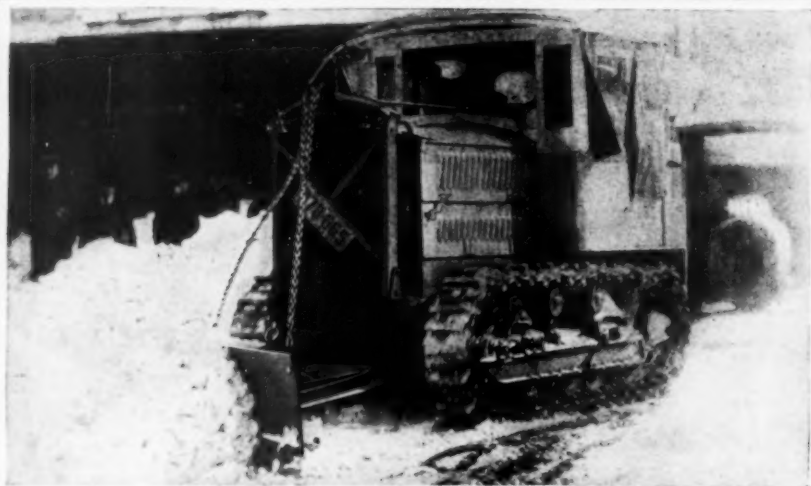
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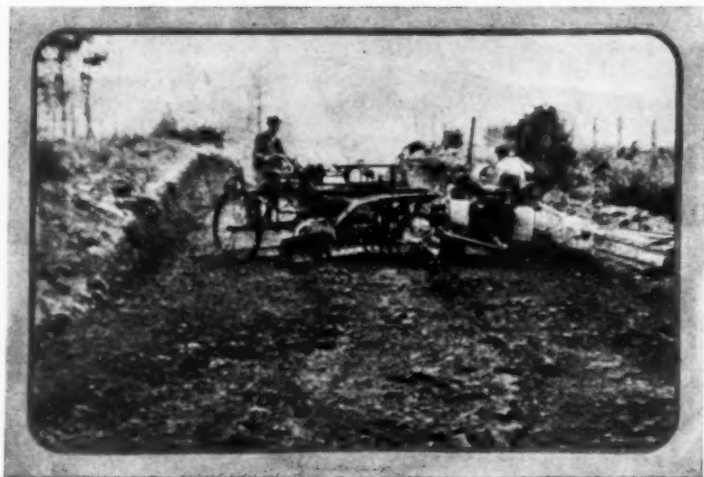
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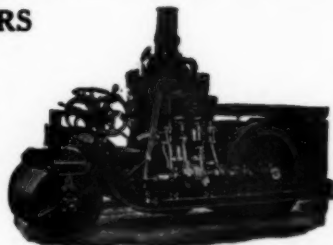
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All Types and Sizes

With or without Scarifier attachment.

Helps you finish the job on time.

Send for catalog A for complete information.



The Buffalo Springfield Roller Co.
Springfield, Ohio.



- *Gallon Iron Works & Mfg. Co., Gallon, Ohio.
- *Good Roads Mach'y Co., Kennett Square, Pa.
- *Monroe & Sons, N. S., Arthur, Ill.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- *Case Threshing Machine Co., J. I., Racine, Wis.
- *Kilbourne & Jacobs Mfg. Co., Columbus, O.
- *Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- *Shaw-Enochs Tractor Co., Minneapolis, Minn.
- *Smith & Sons Mfg. Co., Kansas City, Mo.
- *Stockland Road Machine Co., Minneapolis, Minn.

ROAD OILS. (See Oils, Road.)

ROAD OILERS

- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Connelly & Co., Philadelphia, Pa.
- *Good Roads Mach. Co., Kennett Square, Pa.
- *International Motor Co., New York.
- *Kinney Mfg. Co., Boston, Mass.
- *Littleford Bros., Cincinnati, Ohio.
- *Etnyre & Co., E. D., Oregon, Ill.
- *White Co., Cleveland, O.

ROAD AND PAVING ROLLERS

- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Barber Asphalt Co., Philadelphia, Pa.
- *Buffalo Springfield Roller Co., Springfield, O.
- *Erie Machine Shops, Erie, Pa.
- *Gallon Iron Works & Mfg. Co., Gallon, Ohio.
- *Good Roads Mach. Co., Kennett Square, Pa.
- *Avery Co., Peoria, Ill.
- *Case Threshing Machine Co., J. I., Racine, Wis.
- *Huber Mfg. Co., Marion, O.

ROAD AND PAVING MACHINERY

- *Adams & Co., J. D., Indianapolis, Ind.
- *Atlas Engineering Co., Milwaukee, Wis.
- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Baker Mfg. Co., Springfield, Ill.
- *Barber Asphalt Co., Philadelphia, Pa.
- *Buffalo Springfield Roller Co., Springfield, O.
- *Connelly & Co., Inc., Philadelphia, Pa.
- *Erie Machine Shops, Erie, Pa.
- *Equitable Asph. Maint. Co., Kansas City, Mo.
- *Gallon Iron Works & Mfg. Co., Gallon, Ohio.
- *Good Roads Mach. Co., Kennett Square, Pa.
- *Haiss Mfg. Co., Geo., New York.
- *Holt Mfg. Co., Peoria, Ill.
- *International Motor Co., New York.
- *Kinney Mfg. Co., Boston, Mass.
- *Kochring Co., Milwaukee, Wis.
- *Littleford Bros., Cincinnati, O.
- *Monroe & Sons, N. S., Arthur, Ill.
- *Ransome Concrete Mch'y. Co., Danellen, N. J.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- *Universal Road Mch'y. Co., Kingston, N. Y.
- *Acme Road Mach. Co., Frankfort, N. Y.
- *Aultman & Taylor Mach. Co., Mansfield, Ohio.
- *Austin Machinery Corp'n, Toledo, O.
- *Avery Co., Peoria, Ill.
- *Case Threshing Mach. Co., J. I., Racine, Wis.
- *Cummer & Son Co., P. D., Cleveland, O.
- *East Iron & Mach. Co., Lima, O.
- *Edwards Mfg. Co., C. D., Albert Lea, Minn.
- *Glide Road Mach'y Co., Minneapolis, Minn.
- *Honhorst Co., Jos., Cincinnati, O.
- *Lakewood Engineering Co., Cleveland, O.
- *Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- *Smith Co., T. L., Milwaukee, Wis.
- *Smith & Sons Mfg. Co., Kansas City, Mo.
- *Stockland Road Mach. Co., Minneapolis, Minn.
- *United Iron Works, Kansas City, Mo.

ROCK CRUSHERS AND PULVERIZERS (See "Crushers")

ROCK DRILLS. (See Drills, Rock)

ROOFING, ASPHALT, COMPOSITION, TILE, ETC.

- *Barber Asphalt Co., Philadelphia, Pa.
- *Carey Co., Philip, Cincinnati, Ohio.
- *Servicised Products Co., Chicago, Ill.
- *Standard Oil Co. (Indiana), Chicago, Ill.
- *Texas Co., New York.
- *American Cement Tile Mfg. Co., Pittsburgh, Pa.
- *Atlantic Refining & Asphalt Corp., Phila., Pa.
- *Barrett Co., New York.
- *Beaver Board Co., Buffalo, N. Y.
- *Bird & Son, Inc., E. Walpole, Mass.
- *Certain-teed Products Corp., St. Louis, Mo.
- *Chatfield Mfg. Co., Cincinnati, Ohio.
- *Edwards Mfg. Co., Cincinnati, O.

- *Flintkote Co., Boston, Mass.
- *Johns-Manville, Inc., New York.
- *Keystone Roofing Mfg. Co., York, Pa.
- *Lehon Co., The, Chicago, Ill.
- *Lewis Mfg. Co., F. J., Chicago, Ill.
- *National Roofing Co., Tonawanda, N. Y.
- *Ruberoid Co., New York.
- *Sall Mountain Co., Chicago, Ill.
- *Sifo Products Co., St. Paul, Minn.
- *Sonneborn & Sons, Inc., L., New York.
- *United States Gypsum Co., Chicago, Ill.
- *Western Elastolite Roofing Co., Denver, Colo.

ROOFING, METAL

- *Servicised Products Co., Chicago, Ill.
- *Truscon Steel Co., Youngstown, O.
- *American Rolling Mill Co., Middletown, Ohio.
- *Berger Mfg. Co., Canton, O.
- *Edwards Mfg. Co., Cincinnati, O.
- *Klauser Mfg. Co., Duquesne, Pa.
- *Milwaukee Corrugating Co., Milwaukee, Wis.
- *Nat'l Sheet Metal Roofing Co., Jersey City, N. J.
- *United Alloy Steel Corp'n, Canton, O.
- *Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING KETTLES. (See Kettles)

ROPE, MANILA

- *American Mfg. Co., Brooklyn, New York.
- *Columbian Rope Co., Auburn, N. Y.
- *Capples Cordage Co., Brooklyn, N. Y.
- *Hooven & Allison Co., Xenia, O.
- *Kelly Co., R. A., Xenia, O.
- *New Bedford Cordage Co., New Bedford, Mass.
- *Peoria Cordage Co., Peoria, Ill.
- *Plymouth Cordage Co., N. Plymouth, Mass.
- *Wall Rope Wks., New York.
- *Waterbury Co., New York.
- *Whitlock Cordage Co., New York.

ROPE, WIRE, HOISTING, HAULAGE

- *American Steel & Wire Co., Chicago, Ill.
- *Broderick & Bascom Rope Co., St. Louis, Mo.
- *Leschen & Sons Rope Co., St. Louis, Mo.
- *MacWhythe Co., Kenosha, Wis.
- *Moon Co., Geo. C., Garwood, N. J.
- *Roebbling's Sons Co., J. A., Trenton, N. J.
- *Upson-Walton Co., Cleveland, O.
- *Waterbury Co., New York.
- *Wickwire Spencer Steel Corp., New York.
- *Williamsport Wire Rope Co., Williamsport, Pa.

RUBBER TIRES. (See Tires.)

SAFETY TREADS. (See Treads, Safety)

SASH, ROLLED STEEL. (See Window Frames and Sash)

SAW RIGS, PORTABLE

- *Amer. Saw Mill Mach. Co., Hackettstown, N. J.
- *C. H. & E. Mfg. Co., Milwaukee, Wis.
- *Knickerbocker Co., Jackson, Mich.
- *Oshkosh Mfg. Co., Oshkosh, Wis.

SCARIFIERS

- *Adams & Co., J. D., Indianapolis, Ind.
- *Austin Western Road Mch'y. Co., Chicago, Ill.
- *Barber Asphalt Co., Philadelphia, Pa.
- *Buffalo Springfield Roller Co., Springfield, O.
- *Gallon Iron Works & Mfg. Co., Gallon, Ohio.
- *Good Roads Mach. Co., Kennett Square, Pa.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- *Universal Road Machinery Co., Kingston, N. Y.
- *Acme Road Mach. Co., Frankfort, N. Y.
- *Avery Co., Peoria, Ill.
- *Case Threshing Mach. Co., J. I., Racine, Wis.
- *Huber Mfg. Co., Marion, O.
- *Lyle Cul. & Rd. Equip. Co., Minneapolis, Minn.
- *Stockland Road Mach. Co., Minneapolis, Minn.

SCARIFIERS, TEETH FOR

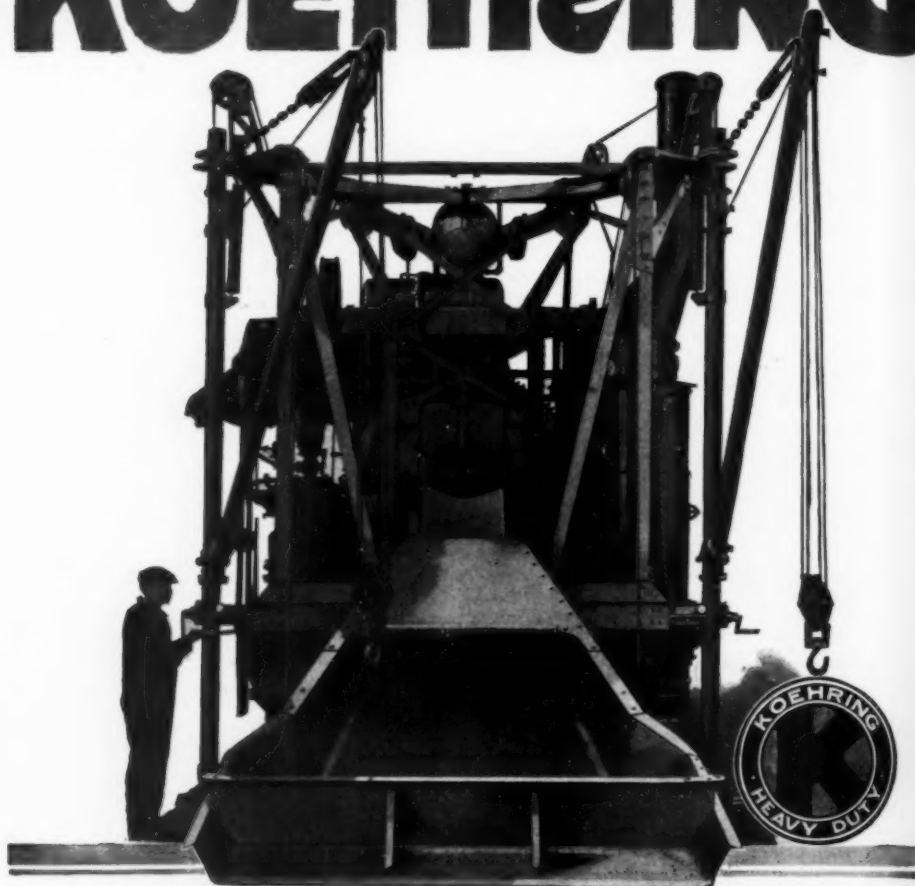
- *Shunk Mfg. Co., Bucyrus, Ohio.

SCRAPERS, ROAD

- *Adams & Co., J. D., Indianapolis, Ind.
- *Austin-Western Road Mch'y. Co., Chicago, Ill.
- *Baker Mfg. Co., Springfield, Ill.
- *Gallon Iron Works & Mfg. Co., Gallon, O.
- *Good Roads Mach. Co., Kennett Square, Pa.

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KOEHRING



Loading End Strains

THINK of strains that the loaded fast-moving skip puts on the mixer frame! How they must tug and twist at the frame! Hundreds of times every working day. Thousands of times every season!

Now look at the Koehring frame construction—how the frame is braced, and re-inforced against strains and stresses from every direction. This is one reason why Koehring driving parts do not get out of alignment and set up unusual wear, breakages and delays. Get this Koehring "Heavy Duty" construction fixed in your mind, and recall it when you think about mixers.

KOEHRING COMPANY, MILWAUKEE, WIS.

Sales Offices and Service Warehouses in Principal Cities

MANUFACTURERS OF CONCRETE MIXERS AND CRANE EXCAVATORS

Koehring Capacities

Pavers: 7, 10, 14, 21, 34 cu. ft. capacities mixed concrete, steam and gasoline. Write for catalog F

Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete, steam and gasoline. Write for catalog C

Dandies: A light staunch mixer for footings, culverts, foundations, etc. 4 and 7 cu. ft. mixed concrete, steam and gasoline. Power charging skip, low charging platform, batch hopper, light duty hoist. Write for catalog D Rubber tires optional.

*Russell Grader Mfg. Co., Minneapolis, Minn.
 Acme Road Mach. Co., Frankfort, N. Y.
 Avery Co., Peoria, Ill.
 Case Threshing Machine Co., J. I., Racine, Wis.
 East Iron & Machine Co., Lima, O.
 Kilbourne & Jacobs Mfg. Co., Columbus, O.
 Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
 Root Spring Scraper Co., Kalamazoo, Mich.
 Sidney Steel Scraper Co., Sidney, O.
 Smith & Sons Mfg. Co., Kansas City, Mo.
 Western Wheel Scraper Co., Aurora, Ill.

SCRAPERS, SELF-LOADING

*Baker Mfg. Co., Springfield, Ill.
 Smith & Sons Mfg. Co., Kansas City, Mo.

SCREENS, SAND, GRAVEL AND COAL

*Atlas Eng. Co., Milwaukee, Wis.
 *Austin Western Road Mach. Co., Chicago, Ill.
 *Good Roads Mach'y Co., Kennett Square, Pa.
 *Hais Mfg. Co., Geo., New York.
 *Littleford Bros., Cincinnati, O.
 *Robins Conv. Belt Co., New York.
 *Russell Grader Mfg. Co., Minneapolis, Minn.
 *Universal Road Machinery Co., Kingston, N. Y.
 Allis-Chalmers Mfg. Co., Milwaukee, Wis.
 Austin Mfg. Co., Chicago, Ill.
 Bartlett & Snow Co., Cleveland, O.
 Case Threshing Machine Co., J. I., Racine, Wis.
 Chain Belt Co., Milwaukee, Wis.
 Gallon Iron Wks. & Mfg. Co., Gallon, Ohio.
 Gifford-Wood Co., Hudson, N. Y.
 Hendrick Mfg. Co., Carbondale, Pa.
 Jeffrey Mfg. Co., Columbus, O.
 Link-Belt Co., Chicago, Ill.
 Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
 Newway Eng. Co., New York, Mich.
 New Jersey Wire Cloth Co., Trenton, N. J.
 Sackett Screen & Chute Co., H. B., Chicago, Ill.
 Webster Mfg. Co., Chicago, Ill.
 Weller Mfg. Co., Chicago, Ill.
 Wickwire Spencer Steel Corp., New York.

SCREENS, SEWAGE

Chain Belt Co., Milwaukee, Wis.
 Link-Belt Co., Chicago, Ill.
 Sanitation Corp'n, New York.

SCREWS

American Screw Co., Providence, R. I.
 Clark Bros. Belt Co., Milledale, Conn.
 St. Louis Screw Co., St. Louis, Mo.

SEWAGE DISPOSAL APPARATUS

Direct Oxidation Disposal Corp., Phila., Pa.
 Dorr Co., New York
 Pacific Flush Tank Co., Chicago, Ill.
 Sanitation Corp'n, New York.

SEWAGE PUMPS (See "Pumps, Centrifugal")**SEWAGE EJECTORS**

Pacific Flush Tank Co., Chicago, Ill.
 Sanitation Corp'n, New York.
 Yeomans Bros. Co., Chicago, Ill.

SEWER BLOCKS, SEGMENT

American Vit. Products Co., Akron, O.
 Cannelton Sewer Pipe Co., Cannelton, Ind.
 Denver Sewer Pipe & Clay Co., Denver, Col.
 Evans & Howard Fire Brick Co., St. Louis, Mo.
 Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
 Laclede Christy Clay Products Co., St. Louis, Mo.
 Macomb Sewer Pipe Wks., Macomb, Ill.
 Pacific Clay Products Co., Los Angeles, Cal.
 Red Wing Sewer Pipe Co., Red Wing, Minn.
 Robinson Clay Product Co., Akron, O.
 Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER CLEANING APPARATUS

Champion Corporation, Hammond, Ind.
 Self Propelling Nozzle Co., New York.
 Thompson-Fleming Co., Inc., Buffalo, N. Y.
 Turbine Sewer Machine Co., Milwaukee, Wis.

SEWER PIPE AND DRAIN TILE

American Vit. Products Co., Akron, O.
 Blackmer & Post Pipe Co., St. Louis, Mo.
 Dee Co., Wm. E., Chicago, Ill.

Delaware Clay Products Co., Pittsburgh, Pa.
 Denver Sewer Pipe & Clay Co., Denver, Col.
 National Fireproofing Co., Pittsburgh, Pa.
 Ohio Vitified Pipe Co., Uhrichsville, O.
 Robinson Clay Product Co., Akron, O.

SEWER RODS

Bissell Co., F., Toledo, O.
 Champion Corporation, Hammond, Ind.
 Turbine Sewer Machine Co., Milwaukee, Wis.

SHINGLES, METAL

Berger Mfg. Co., Canton, Ohio.
 Canton Art Metal Co., Canton, Ohio.
 Chattanooga Rfg. & Fdry Co., Chattanooga, Tenn.
 Edwards Mfg. Co., Cincinnati, Ohio.
 Eller Mfg. Co., Canton, Ohio.
 Milwaukee Corrugating Co., Milwaukee, Wis.
 Nat'l Sheet Metal Roofing Co., Jersey City, N. J.
 Newport Rolling Mill Co., Newport, Ky.
 Penn Metal Co., Boston, Mass.
 Kluener Mfg. Co., Dubuque, Ia.
 Tiffin Art Metal Co., Tiffin, Ohio.
 Wheeling Metal Mfg. Co., Wheeling, W. Va.

SHOVELS, ELECTRIC

Bucyrus Co., South Milwaukee, Wis.
 Marion Steam Shovel Co., Marion, O.
 Thew Shovel Co., Lorain, O.

SHOVELS, GASOLINE

*Pawling & Harnischfeger Co., Milwaukee, Wis.
 American Steel Dredge Co., Fort Wayne, Ind.
 Austin Machinery Corp'n, Toledo, O.
 Bay City Dredge Works, Bay City, Mich.
 Fairbanks Steam Shovel Co., Marion, O.
 Marion Steam Shovel Co., Marion, O.
 Thew Shovel Co., Lorain, O.

SHOVELS, HAND

American Shovel & Stamping Co., Lorain, O.
 Ames Shovel & Tool Co., Boston, Mass.
 Beall Bros. Co., Alton, Ill.
 Conneaut Shovel Co., Conneaut, O.
 Hubbard & Co., Pittsburgh, Pa.
 Indiana Shovel Co., New Castle, Ind.
 Jackson Shovel Co., Montpelier, Ind.
 Pittsburgh Shovel Co., Pittsburgh, Pa.
 Russell Shovel Co., Aliquippa, Pa.
 Stevens-Webb Co., Inc., Altoona, Pa.
 Union Furnace Mfg. Co., Altoona, Pa.
 Wood Shovel & Tool Co., Piqua, Ohio.
 Wyoming Shovel Works, Wyoming, Pa.

SHOVELS, STEAM

*Austin Machinery Corp'n, Toledo, O.
 *Fairbanks Steam Shovel Co., Marion, O.
 *Keystone Driller Co., Beaver Falls, Pa.
 American Steel Dredge Co., Fort Wayne, Ind.
 Bellwood Steam Shovel Co., Bellwood, Pa.
 Browning Co., Cleveland, O.
 Bucyrus Co., South Milwaukee, Wis.
 Byers Machine Co., J. F., Ravenna, Ohio.
 Fairbanks Steam Shovel Co., Marion, O.
 Industrial Works, Bay City, Mich.
 Marion Steam Shovel Co., Marion, O.
 Osgood Co., Marion, O.
 Smith Co., T. L., Milwaukee, Wis.
 Thew Shovel Co., Lorain, O.

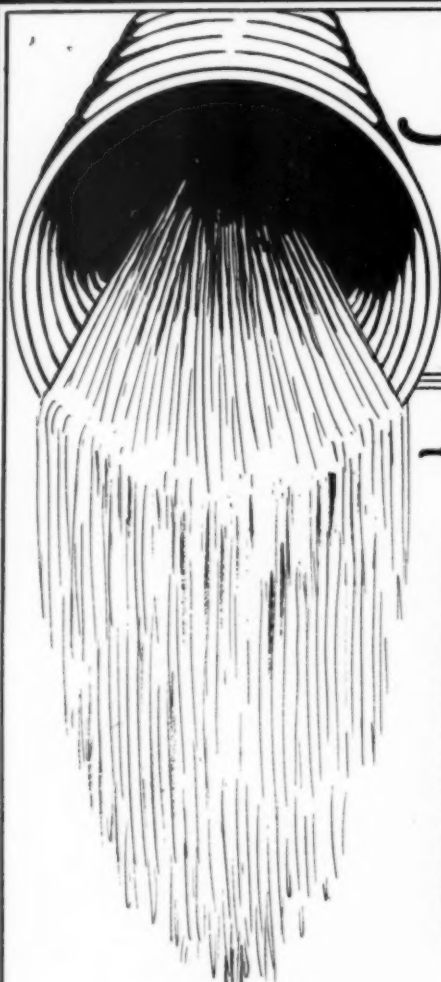
SIGNS, STREET AND ROAD

Baltimore Enamel & Novelty Co., Baltimore, Md.
 Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
 Lyle-Signs, Minneapolis, Minn.
 Municipal Products & Elec. Co., Buffalo, N. Y.
 Municipal Street Sign Co., New York.
 Nelke Sign Co., J. L., New York.
 Union Iron Products Co., East Chicago, Ind.
 Western Display & Mfg. Co., St. Paul, Minn.

SIGNS, TRAFFIC

Automatic Signal & Sign Co., Canton, O.
 Best Traffic Light Co., E. Peoria, Ill.
 Elkhart Fdry. & Mach. Co., Elkhart, Ind.
 Esco Mfg. Co., Peoria, Ill.
 Federal Signal Co., Albany, N. Y.
 Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
 Little Giant Co., Mankato, Minn.
 Lyle-Signs, Minneapolis, Minn.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.



Newport

RUST-RESISTING

Culverts

—A LONG LIFE AND A
USEFUL ONE—

To stand up under the attacks of acid soils and other corrosive agents, culverts must be made of the most economical rust-resistant metal. Newport Culverts are made of **GENUINE OPEN-HEARTH IRON**, guaranteed to be 99.875 per cent pure iron copper alloy, the best rust-resistant metal on the market today for culvert service.

Our free booklet on Newport Culverts records complete chemical tests of the materials in these half-round and full-circle types of corrugated culverts. It also contains illustrated descriptions of actual installations that show accurately and forcefully the meaning of

NEWPORT CULVERT SERVICE

Newport Culvert Co.

542 West Tenth Street

Newport, Kentucky

Mound Traffic Equip. Co., Columbus, O.
Safety Traffic Lt. Co., Milwaukee, Wis.
Thomson Bros., Chicago, Ill.
Traffic Sign & Signal Co., Gloucester, Mass.
Thompson-Fleming, Inc., Buffalo, N. Y.
Union Iron Products Co., E. Chicago, Ind.

SLATE, ROOFING

Vendor Slate Co., Inc., Easton, Pa.

SLATE, STRUCTURAL

Keenan Structural Slate Co., Bangor, Pa.
Penna. Structural Slate Co., Easton, Pa.
Phoenix Slate Co., Windgap, Pa.
Structural Slate Co., Pen Argyl, Pa.

SLEEVES, TAPPING AND VALVE

Mueller Mfg. Co., Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
Smith Mfg. Co., A. P., East Orange, N. J.

SLUICE GATES. (See Gates, Sluice.)

SMOKE STACKS. (See Stacks, Steel)

SNOW CLEANING MACHINERY

*Austin-Western Road Mch. Co., Chicago, Ill.
*Baker Mfg. Co., Springfield, Ill.
*Good Roads Mach. Co., Kennett Square, Pa.
*Holt Mfg. Co., Peoria, Ill.
*International Motor Co., New York.
Avery Co., Peoria, Ill.
Barber-Greene Co., Aurora, Ill.
Cleveland Tractor Co., Cleveland, Ohio.
Monarch Tractors, Inc., Watertown, Wis.
Toy Co., W. M., Sidney, Ohio.
J. T. Tractor Co., Cleveland, O.
Owensboro Ditcher & Grader Co., Owensboro, Ky.

SPRAYING MACHINERY

Rean Spray Pump Co., Lansing, Mich.
Deming Co., The, Salem, Ohio.
Field Force Pump Co., Elmira, N. Y.
Fitzhenry-Guptill Co., East Cambridge, Mass.

SPREADERS, STONE

*Austin-Western Road Mch. Co., Chicago, Ill.
*Burch Flow Works Co., Crestline, O.

STACKS, STEEL

*Connery & Co., Inc., Philadelphia, Pa.
*Heli Co., The, Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Blaw-Knox Co., Pittsburgh, Pa.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Honhorst Co., Jos., Cincinnati, O.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Seafie & Sons Co., Wm. B., Pittsburgh, Pa.
Walsh & Weldner Boiler Co., Chattanooga, Tenn.

STEAM SHOVELS. (See Shovels, Steam)

STANDPIPES, TANKS AND TOWERS

*Connery & Co., Inc., Philadelphia, Pa.
Caldwell Co., W. E., Louisville, Ky.
Chattanooga Blr. & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Lancaster Iron Wks., Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco, Cal.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
United Iron Works, Kansas City, Mo.
Walsh & Weldner Boiler Co., Chattanooga, Tenn.

STEAM TURBINES

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
De Laval Steam Turbine Co., Trenton, N. J.
Ingersoll-Rand Co., New York.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

STEEL PLATE CONSTRUCTION

*Connery & Co., Philadelphia, Pa.
*Heli Co., The, Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Bethlehem Steel Co., Bethlehem, Pa.
Biggs Boiler Wks., Akron, O.
Blaw-Knox Co., Pittsburgh, Pa.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Graver Corporation, E. Chicago, Ind.
Heltzel Steel Form & Iron Co., Warren, O.
Hendrick Mfg. Co., Carbondale, Pa.
Honhorst Co., Jos., Cincinnati, Ohio.
McClintic-Marshall Co., Pittsburgh, Pa.
Pennsylvania Bridge Co., Beaver Falls, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Ritter-Conley Co., Pittsburgh, Pa.
Seafie & Sons, Wm. B., Pittsburgh, Pa.
Toledo Crane Co., Toledo, O.
Union Iron Works, Hoboken, N. J.
Vulcan Iron Works, Jersey City, N. J.
Walsh & Weldner Boiler Co., Chattanooga, Tenn.

STOKERS, MECHANICAL

Automatic Furnaces Co., Dayton, Ohio.
Babcock & Wilcox Co., New York.
Combustion Engine Corp., New York.
Detroit Stoker Co., Detroit, Mich.
Laclede-Christy Clay Prod. Co., St. Louis, Mo.
Murphy Iron Works, Detroit, Mich.
Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

STREET AND ROAD SIGNS. (See Signs, Street and Road.)

STREET CLEANERS' CARTS

*Rochester Can Co., Rochester, N. Y.
Durlach Can & Iron Works, Brooklyn, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS

*Austin-Western Road Mch. Co., Chicago, Ill.
*Federal Motor Truck Co., Detroit, Mich.
*General Motors Truck Co., Pontiac, Mich.
*Heli Co., The, Milwaukee, Wis.
*International Motor Co., New York.
*Municipal Supply Co., South Bend, Ind.
Autocar Co., Ardmore, Pa.
Etnyre & Co., E. D., Oregon, Ill.
Packard Motor Car Co., Detroit, Mich.
Pierce Arrow Motor Car Co., Buffalo, N. Y.
Tiffin Wagon Co., Tiffin, O.
White Co., Cleveland, O.

STREET LAMP POSTS

Glow & Sons, J. B., Chicago, Ill.
Drake Mfg. Co., Friendship, N. Y.
Electric Railway Equipment Co., Cincinnati, O.
General Electric Co., Schenectady, N. Y.
King Mfg. Co., Chicago, Ill.
Massey Concrete Products Co., Chicago, Ill.
Mott Iron Wks., J. L., New York.
Union Metal Mfg. Co., Canton, O.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

STREET SIGNS (See Signs, Street)

STREET SWEEPERS

*Austin-Western Road Mch. Co., Chicago, Ill.
*Good Roads Mach. Co., Kennett Square, Pa.
*Universal Road Machinery Co., Kingston, N. Y.
Elgin Sales Corp'n, New York.
Springfield Motor Sweeper Co., Springfield, O.

STRUCTURAL STEEL AND IRON. (See Bridges and Buildings)

STUMP PULLERS

Bennett & Co., H. L., Westerville, O.
Glyde Iron Works, Duluth, Minn.
La Plant-Chaste Mfg. Co., Cedar Rapids, Ia.
Thomas Elevator Co., Chicago, Ill.

SUPERHEATERS

Babcock & Wilcox Co., New York.
Power Specialty Co., New York.
Superheater Co., New York.

SURVEYORS' INSTRUMENTS. (See Instruments.)

SWITCHBOARDS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

PROTECT YOUR PAVEMENTS USE

IDEAL EXPANSION JOINT

*The Ideal Method of Providing for
Expansion in Improved Pavements*

CONVENIENT

SAFE

ECONOMICAL

A Standardized Preformed Paving Joint
made of high grade "filler" asphalt

Shipments made in crates or boxes weighing about 325 lbs.

Full Information and Prices on Request

THE WARING-UNDERWOOD COMPANY

Commercial Trust Building, Philadelphia, Pa.

MAKE BETTER ASPHALT STREET REPAIRS



The Improved Equitable Asphalt Heater Softens 1500 Square Yards a Day

Proper bonding of old and new asphalt is made possible by this fool proof machine which does not require hot water to operate. The heating hood slides on the ground saving time and heat. The machine heats 45 square feet of pavement in 1 to 2 minutes and moves quickly ahead. Send for our new prices and specifications.

THE EQUITABLE ASPHALT MAINTENANCE COMPANY
1901 Campbell Street
Kansas City, Mo.

Where to Purchase

47

TABLES AND BOARDS, DRAWING. (See Drawing Materials.)

TAMPING MACHINES

*Pawling & Harnischfeger Co., Milwaukee, Wis.
Construction Mach'y Co., Waterloo, Ia.
Ingersoll-Rand Co., New York

TANKS, AIR COMPRESSOR

*Connery & Co., Inc., Philadelphia, Pa.
*Heli Co., Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Abendroth & Root Mfg. Co., New York.
Biggs Boiler Wks., Akron, O.
Graver Corporation, E. Chicago, Ind.
Indiana Air Pump Co., Indianapolis, Ind.
Chicago Bridge & Iron Works, Chicago, Ill.
Ingersoll-Rand Co., New York.
Lancaster Iron Wks., Lancaster, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
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*Heli Co., Milwaukee, Wis.
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Avery Co., Peoria, Ill.
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Dover Boiler Wks., New York.
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Graver Corporation, E. Chicago, Ind.
Hardisty Mfg. Co., B., Denver, Cal.
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Honhorst Co., Jos., Cincinnati, Ohio.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco, Cal.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
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American Tar Products Co., Chicago, Ill.
Barrett Co., New York.

TAR KETTLES. (See Kettles)

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TIES, STEEL

*Koppel Ind. Car & Equip. Co., Koppel, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Sweet's Steel Co., Williamsport, Pa.

TIMBER CLAMPS

Pyle-Rogers Corp., New York.

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Firestone Tire & Rubber Co., Akron, O.
Fisk Tire Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., New York.
Republic Rubber Co., Youngstown, O.
U. S. Tire Co., New York.

TOOL HOUSES, PORTABLE STEEL

*Littleford Bros., Cincinnati, O.

TOWERS (See Standpipe Tanks and Towers)

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Atlas Car & Mfg. Co., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Fdry. & Mfg. Co., Columbus, O.
Easton Car & Consn. Co., New York.
Hunt Co., Inc., C. W., West New Brighton, N. Y.
Lakewood Engineering Co., Cleveland, O.

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*International Motor Co., New York.
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White Company, The, Cleveland, O.

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Highway Trailer Co., Edgerton, Wis.
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Troy Wagon Works, Troy, O.
Warner Mfg. Co., Beloit, Wis.
Watson Products Corp'n., Canastota, N. Y.

TRAILERS, INDUSTRIAL

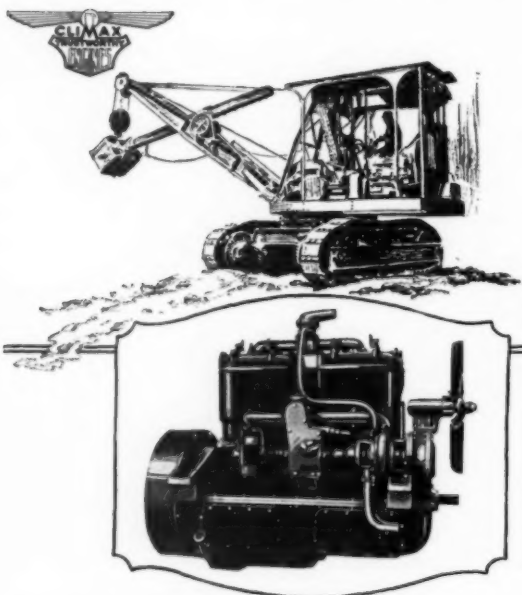
Chase Fdry. & Mfg. Co., Columbus, O.
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Made in two sizes: Model K, 10 ton and Model A, 14 ton. The *Excavator Shimmer Shocker* is in new catalogs and advertising shows how much money the 1980 Contractors in the United States. Ask for details.



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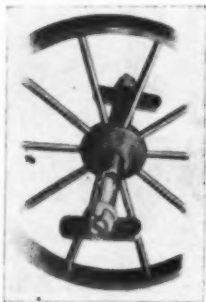
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Self-Lubricating



Shorten the distance between spokes on tire and you obviously strengthen the wheel.

Then too there is a self-lubricating bearing in each end of the Sterling wheel hub which lessens the effect of wheeling. Every Sterling barrow is equipped with this self-lubricating 10 spoke wheel. It pays to buy Sterling barrows for the wheel alone—it is different and better.

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45

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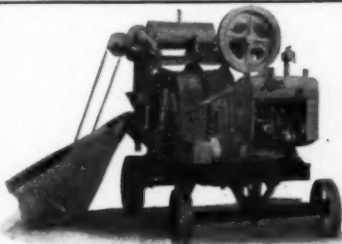
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Barrows for Every Job Price and Delivery Right

Send For Particulars

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Atlas YARDAGE

120 to 150 Cu. Yds. in 10 hours with an Atlas one bag Mixer.

Atlas Mixers are of sturdy dependable construction, and the 7-S is regularly equipped with multiple cylinder LeRoi Engine, giving excess power.

We build 3½ ft., ½ bag, 1 bag and 2 bag Mixers.

Dealers write for agency proposition.

ATLAS ENGINEERING COMPANY

3036 GALENA STREET,

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first!

Ransome made the first Steel Chuting Plant back in 1909.

Then came the Ransome Heavy Steel Tower—the first Steel Tower strong enough to carry a boom plant with 48 feet counterweight chute having its inner end tied down and carrying at its unsupported outer end a 48 foot swivel head chute.

Ransome is first again this year with a new channel and angle construction for the front posts—61% stronger than a section of the usual "Z" bar section of the same weight per foot.

Engineers and Contractors naturally look to Ransome first for new and improved equipment for mixing and placing concrete.

RANSOME CONCRETE MACHINERY CO.

1750 Second Street, Dunellen, N. J.

Manufacturers of Mixers, Pavers, Pneumatic Mixers, Chuting Plants, Mold Buckets, Bins, Cans, Carts, etc.

Ransome Steel Chuting Plant on the 40,000 Horse Power Extension to the Hydro-Electric Power Plant of the Pennsylvania Water & Power Co., at Holtwood, Pa., Constructed by Day & Zimmerman, Inc., Engineers

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Without obligation on my part, please send me information on—

Building Mixers, sizes 1-S, 7-S, 10-S, 11-S, 21-S, 24-S, Driven by Belt, Steam, Gasoline, Electric,

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Running a Large Building Contracting Organization

One Large Contractor Operates Own Woodworking Mill, Paint Shop and Dry-Kiln
Holds Monthly Meetings, Some of Which Are Open to the Public

By Frank N. Goble

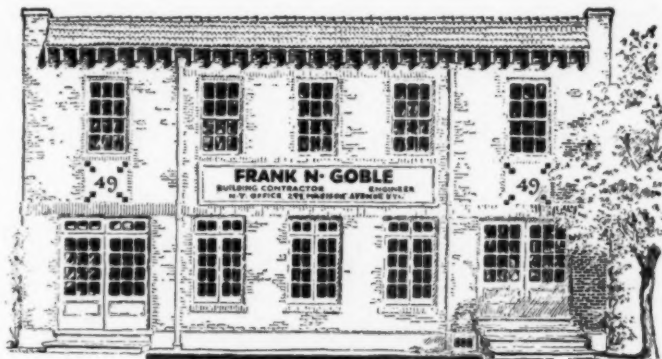
President, Frank N. Goble, Inc., White Plains, N. Y.

MANY contractors who are doing large work or are combining with it smaller jobs frequently have difficulty in getting quickly the odds and ends of millwork that they require, even the main parts of the woodwork, frames, cornice, trim, sash and doors, etc., for their jobs. The larger woodworking mills can hardly afford to break into their routine schedule to get out small miscellaneous orders or to make changes in material scheduled or in process of manufacture.

Some few years ago so much difficulty was

experienced by the firm of Frank N. Goble that we decided to operate a small mill of our own, particularly to take care of the smaller repair and alteration jobs and the last-minute changes and additions to the larger contracts.

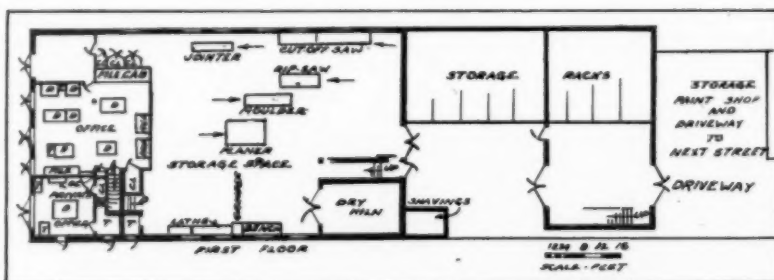
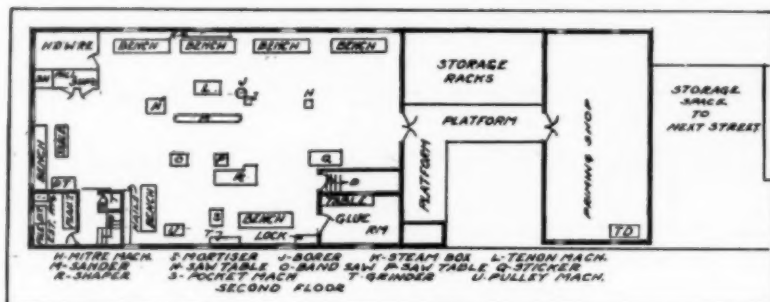
At first a small mill was rented, the property belonging to one party and the machinery to another—a small contractor who had been doing mostly repair jobs. After some six or eight months it was decided to purchase the property and the machinery in order that a larger and more efficient mill might be oper-



FRONT OFFICE AND MILL BUILDING
49 BROOKFIELD STREET, WHITE PLAINS, N.Y.
FRONT OF OFFICE BUILDING

ated and to provide storage room. Property 42 by 250 feet running through from street to street was purchased, and a two-story terra cotta and brick building with heavy floor timbers was erected facing the better of the two streets. Fortunately, the old building was on the rear of this lot and was continued as a storage building, the upper floor being used as a place where finished woodwork could be stored and primed before delivery to the jobs.

and then through to the jointer to straighten the edges or to the rip-saw, and then back through either the moulder or the planer: for long mouldings, of course, the material goes over the rip-saw, then back through the moulder or planer. Such material as is to be further worked for frames, trim, dressers, etc., is taken upstairs, where are the lighter machines for mortising and tenoning or special work on the hand-saw or shaper, and then to



MILL & OFFICE
FRANK N GOBLE, INC.
49 BROOKFIELD ST. WHITE PLAINS, N.Y.

In this new building was installed some of the old machinery with such new as was required. On the ground floor is placed the heavy machinery arranged in such a way that all material is worked with a minimum of handling. Coming into the rear of the building from the storage yard, the rough lumber goes usually first to the cut-off saw, where it is cut into lengths to the schedule required,

be assembled by the bench hands. A belt sander is used for cleaning up nearly all of the materials, as this type of sanding machine lends itself most readily to either flat or moulded surfaces.

All machines are electrically driven, either individually or in small groups for the lighter machines.

The dry kiln is on the first floor, heated by



CABINET SHOP ON SECOND FLOOR

a hot air furnace below, and above is a glue room, all of this being fire-proof with concrete floors and fire-doors. This furnace helps to heat the rear of the building. The whole arrangement has been carefully studied so as to reduce the handling of materials as much as possible.

The General Office

Some three years ago the firm decided to give up the New York office which it had occupied for a number of years, and to move all of the office force to White Plains. To do this, the front part of the mill building was arranged as an office and 16 feet was added to the building to take care of this change.

The general office occupies a space about 24 by 20 feet and there is a small private office about 12 by 14 feet, under which is installed a steam heating boiler which heats the offices and part of the mill building. The estimating room is in one corner of the second floor at the head of the stairs. While the office is very close to the noisy machinery, the ceilings and partitions have been so carefully insulated that no disturbance is occasioned in the office because of this proximity.

In order to keep closely in touch with the architects and material dealers in New York City, a representative of the firm is in New York two or three times a week, and with ade-



GENERAL OFFICE

quate telephone facilities the company easily keeps in touch with the Metropolitan District. As the members of the firm and most of the people connected with the organization live in White Plains, they are able to do more work because they are relieved of the wear of the daily New York journey.

In building the office and other rooms, use was made of various building materials so that to a certain extent owners and architects can see in place various kinds of brick laid up in different bonds and mortars, various woods in different finishes, and different wall and ceiling treatments. This has been frequently favorably commented upon by visitors and clients.

For some twenty years we have been doing construction work in and around New York, all of high-class character such as banks,

under the direction of an expert superintendent. This department handles not only all of the painting work in connection with the general contracts, but undertakes painting and decorating work of any size. We have clients who have us repaint and redecorate every three or four years. As only the best obtainable grades of material are used, and as they are applied under very careful supervision, the clients have found by experience that it pays to employ the firm even though the initial cost seems high. The materials of this department being inflammatory, they are housed in a separate fire-proof building designed especially for that purpose, and, wherever possible, advantage is taken of low markets to lay in considerable quantities of standard, high-grade materials.



PRIVATE OFFICE

churches, hospitals, private schools, and residences. We are always willing to do small repair and alteration work because it brings us in touch with people from whom we sometimes receive larger contracts. This small work is not very profitable on account of the excessive supervision which it demands and the seasonable nature of it. We have found that our own woodworking equipment and an adequate stock of lumber and materials enable us to give the best of service.

To house our automotive equipment, which consists of eight cars and trucks, and to give housing to other equipment, we purchased a lot with a one-story frame building on it adjacent to the other holdings. As many as a hundred men leave the premises in the morning in the various vehicles for the different jobs throughout Westchester County, covering the county within a radius of twenty-five miles.

An excellent painting and decorating department is combined with the other work un-

Monthly Meetings

A feature which is probably unique in this organization is the monthly meeting of all the superintendents, the foreman and the office force. At these meetings are discussed various problems pertaining to the office and estimating work, the field construction, and the co-ordination of the various operations. Cost records are kept of the different classes of work on each job, all labor and materials being carefully distributed according to a definite schedule, and these records are entered in a special cost ledger so that at all times the actual status of any part of any job can be arrived at. Each week the labor items are collected on a sheet for each job, and these records are discussed with the superintendents. Once a month a complete cost summary of all the items on the job, both material and labor to date, is prepared, and at the monthly conferences these cost summaries are discussed. This monthly cost summary shows the actual cost and the estimated cost in parallel columns

of both labor and materials, and the actual and estimated total costs. Where the actual costs exceed the estimate the superintendent has to explain why.

At some of these monthly meetings outsiders are invited to give talks upon such subjects as "Cement, Its Manufacture and Uses," "Paint as a Structural Building Material," and "Face Brick." Two meetings have been open to the public, held in the Community House, and have been illustrated both with moving pictures and lantern slides. The first was on "Architectural Terra Cotta," by F. S. Laurence of the National Terra Cotta Society, and one on "Asbestos and Its Use," by a representative of the Johns-Manville Company.

Short musical programs have been rendered by some of the employees in connection with these open meetings, especially by a quartette of colored men, who sang Southern melodies, which were much enjoyed.

All the apprentices of the firm were invited to one of the meetings and some 15 of them were present, the older men giving some of their early experiences and contrasting present-day conditions with those that prevailed twenty or thirty years ago. Close contact is kept with these apprentices in an attempt to give them as good opportunity as is possible to thoroughly learn their trade and to have them appreciate that they are a part of an organization which is interested in their welfare.

Book Reviews

ACOUSTICS OF BUILDINGS, INCLUDING ACOUSTICS OF AUDITORIUMS AND SOUND-PROOFING OF ROOMS

By F. R. Watson, Professor of Experimental Physics, University of Illinois, Urbana, Illinois. John Wiley & Sons, Inc., New York. 1923. VIII + 155 pp. Illustrations, diagrams, and tables. Price \$3.00.

City officials, builders and architects will be particularly interested in this well-prepared, complete book on the art and science of acoustics. It describes briefly the action of sound within buildings, covering echoes, reverberations and sound-proofing. It is replete with the necessary mathematical formulas, which have been simplified through the results of experimental tests. Space is also devoted to the correction of acoustic difficulties found in many buildings.

SURVEYING AND BOUNDARIES

By Frank Emerson Clark, Minneapolis, Minn. The Bobbs-Merrill Company, Indianapolis, Ind. 1922. XXXVII + 631 pp. Illustrated. \$5.00.

The author of this concise, yet thorough, treatise, giving a line on every phase of the subject, with diagrams and instructions, is to be congratulated on producing a book almost any chapter of which is worth many times the price of the entire volume. It should prove a particularly helpful volume for contracting engineers and their attorneys, surveyors and municipal engineers, as it covers its broad field very thoroughly and is so well indexed, both by cases and by subjects, that ready reference can be made to any legal questions arising in the subject of surveying and boundaries. The individual chapters deal specifically with the surveying of public land, the general nature of surveys and the duties of surveyors, base lines, principal meridians and townships, subdividing townships and sections, fractional lots, numbering and areas, streams, lakes and ponds, excess and deficiency and their appor-

tionment to several subdivisions, meander corners and meander lines, marking lines and corners, identification of tract, riparian rights, the restoration of lost or obliterated corners and subdivision of sections, evidence of location of corners or lines, boundaries between states and nations, the meanings of words used in descriptions, answers to usual and unusual questions, the dedication of land to public or charitable use, and estoppel, agreements on boundaries and surveyors, the liabilities and rights of surveyors, plats and plating lands, adverse possession, highways, surveys of the original thirteen states, and the rectangular system in use in the Dominion of Canada. There is scarcely a surveyor, engineer or technical official in a public office who can afford to be without this complete, authoritative work.

PRINCIPLES AND PRACTICES OF UP-KEEP

PAINTING

Prepared and published by the Paint and Varnish Division, E. I. Du Pont de Nemours & Co., Inc., 35th Street and Greys Ferry Road, Philadelphia, Pa. 1923. Edited by Roy C. Sheeler. 200 pp. Illustrated. Price \$2.00.

This book has been written as a practical aid to plant superintendents and others responsible for the maintenance of industrial property and equipment and as a help to architects and engineers in the protection of new construction. Contractors will be much interested in the explicit manner in which it describes various painting operations and the types of paint best adapted for all types of exterior and interior surfaces. After a complete description of paint and varnish making and tests, specific chapters are devoted to the general methods of application of paints, painting exterior wood surfaces and the treatment of interior wood surfaces, the painting and preservation of metal surfaces, the treatment of concrete and cement surfaces, light reflecting finishes for interior walls and ceilings, and spray-painting.

Miscellaneous Notes

Nichols Enters Consulting Practice

John R. Nichols, who for the last ten years has been chief engineer with Monks & Johnson, has announced the opening of an office as a consulting engineer, at 161 Devonshire Street, Boston, Mass., where he is prepared to advise in regard to the design of structures and to make investigations and reports in the fields of civil or structural engineering. Mr. Nichols was graduated from Harvard University in 1906, was for three years a designer with contractors, specializing in reinforced concrete construction, and was for four years an instructor in mechanical and civil engineering at Harvard.

New Portland Cement Offices

THE Portland Cement Association, 111 West Washington Street, Chicago, Ill., has announced the appointment of three new district engineers, as follows: James A. Hudson, in charge of the office in Memphis, Tenn., the Exchange Building; P. H. Johnston, in charge of the Jacksonville, Fla., office, in the Graham Building; and J. R. Fairman, in Birmingham, Ala., in the Jefferson County Bank Building.

Walter B. Elcock has been appointed Assistant General Manager in charge of the southeastern offices of the Portland Cement Association, with headquarters in the Hurt Building, Atlanta, Ga.

The Engineer in Public Affairs

He Is a Dominantly Creative Force in Civilization

AT a meeting of joint engineering groups held in the Engineering Societies Building, Gano Dunn, President of the J. G. White Engineering Corporation, urged the need of organized effort in public affairs by engineers. He said:

"While there are in the ranks of engineers men of leading opinion in one direction and men of leading opinion in the other direction, and there is not to-day that agreement which many of us like to see. I think if we all stand off a distance and look, we will get a perspective that will be of great value. I hold these principles to be self-evident, that engineers cannot continue to go on as entirely separate and distinct organizations, that there is something in the human side of all the engineering branches that needs contact with the other branches, and that there is as yet undeveloped force and power among engineers as a profession that, if properly united and polarized, and made to pull all one way, can speak for engineers, can represent them and can make them a force in the community that they have not yet been made.

"A discussion of 'The Engineer in Public Affairs' necessarily turns our attention rather more toward the side of engineering that has received more attention in late years than ever before—the side of the engineer's generalship, the side of the engineer's organizing capacity, the side of the engineer's human contact. There has never been a time when the demand for

the education of engineers in the humanities, as well as in the sciences and the technologies, has been as great as it is to-day. There never has been a time when the demand for the education of engineers in English, in literature, in the fine arts, has been as great as it is to-day. The reason is an appreciation, not only on the part of engineers themselves, but on the part of those with whom they work, that an engineer must be an all-round man before he can reach the heights of engineering. The groping and

straining towards a larger part in national affairs that has been concomitant with the development of the national and other engineering societies in the last twenty years, has been due to the feeling within engineers themselves that their places as citizens are more and more responsible as every day goes on.

"For my own part, I think there has been a weight of opinion in engineering circles the desirability, if not the appropriateness, of a certain extreme degree of participation of engineers in public affairs. On the other hand, the increasingly essential relation of engineering works and structures, engineering operation, engineering conceptions, and even engineering terms and habits in the daily life of the people of the United States, has been so marked that engineering of itself has been taking a greater and greater part in public affairs, and if the engineer cannot keep pace with his subject, then he certainly is unworthy of the name."

An Engineer's Creed

The idea of devotion to duty as a measure of worth, of worth as a measure of happiness, and of service as the proper aim of each of us, I believe to be true. Particularly do I believe that lasting happiness is found through the medium of unselfish service. The thought of self in service, no matter how big the service, runs counter to nature's laws of compensation. Self-glorification and contentment of spirit are not found on the same trail.

Construction from the Banker's View-Point

Mutual Dependence upon, and Acceptance of, Each Other's Judgment Should Prevail

EVERY important construction project should have the stamp of approval of one or more competent engineers, and should stand the most rigid test as to its financial strength, if the structure proposed is to be in harmony with modern development.

This belief was expressed by Henry D. Thrall, Vice-President and Treasurer of the Minnesota Loan & Trust Company. "With the rapid changes in methods of construction, and marked improvement made in business financing during the past decade, there has been growing cooperation between the engineer and the banker, to the end that the community may reap the just rewards that must come as a re-

sult of a better understanding of the aims and purposes of these two types of organizations which are engaged in the building of cities, industries and communities," said Mr. Thrall.

"In the development of a project the engineer and the banker must necessarily be closely associated. Somebody else may originate the idea, but unless his personal bank account is adequate and unless he is so confident that he does not feel the need of technical knowledge, he is dependent upon the services of both engineer and financier, who must meet in a friendly spirit of cooperation and confidence in each other's judgment."

—The Improvement Bulletin.

LEGAL POINTS FOR CONTRACTORS

These brief abstracts of legal decisions in the contracting fields may aid you in avoiding similar difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer.

Edited by A. L. H. Street, Attorney-at-Law

Construction Foreman's Power to Contract for Employer in an Emergency

Where an employee of a dredging contractor was drowned in the course of his employment, the foreman had no implied authority to bind the contractor for expenses incidental to preparing the body for burial, held the Arkansas Supreme Court in the case of *A. V. Wills & Sons vs. Irby*, 249 Southwestern Reporter, 562. In that case an undertaker attempted to hold the contractor liable for a funeral expense bill incurred at the instance of the foreman, one Durran. Holding that there could be no recovery, the Court observed:

"There is no testimony that Durran had any express authority from appellants to contract in appellants' name for services or supplies of this kind. On the contrary, the testimony is uncontradicted that Durran's express authority was limited to the operation of the dredge boat and the purchasing of necessary supplies in the absence of Bunnell, the superintendent.

"Appellee instituted this action against appellants to recover the amount of the bill, and counsel rely entirely upon either implied authority on the part of Durran to act for his principal in an emergency, or upon a ratification by appellants in failing to repudiate, within a reasonable time, the exercise by Durran of such authority.

"There being no express authority for Durran to make such a contract, the implication of such authority, if it existed at all, must rest upon the necessity for action in an emergency where the principal, or one with express authority, was absent.

"We have illustrative cases where servants of railroad companies have acted by the employment of surgeons in an emergency to attend injured passengers, employees, or strangers, where the injury was inflicted by the train, and it has been held that on account of there being an extreme emergency and the remote absence of the principal, the servant in charge at that particular place where the injury occurs is authorized to act for the principal. . . .

"There are many authorities on this subject, but we have not been able to find any case where liability was imposed for anything except medical or surgical treatment in such an emergency. It has never been applied to attention to the dead, and it ought not to be so applied, for the reason that the preparation and burial of the dead is not an emergency of such immediate and pressing urgency as calls for quick action like the case of the alleviation of suffering of an injured person, or to prevent

death from ensuing. In case of injury to a person it may be a question of hours, or even moments, and the emergency does not justify any delay whatever; but the death of a person creates no such emergency, however great the necessity eventually of burying the dead. It is a matter, in other words, which will wait a few hours, or even longer, giving the time to communicate with those upon whom the burden of the occasion should rest.

"The doctrine being one wholly of necessity and involving the imposition of a legal burden where, under other circumstances, there could be nothing more than possibly a moral obligation, it should not be extended beyond the circumstances which first gave it rise."

Building Contract Clause for Damages for Delay Held Unenforceable

The following is the gist of one of the points decided by the Arkansas Supreme Court in the case of *J. E. Hollingsworth & Co. vs. Leachville Special School District*, 249 Southwestern Reporter, 24:

Where a contract to erect a school building provided for \$25 per day as liquidated damages for each day it remained uncompleted after October 20 and gave the architect the right to make certificate against the contractor, on failure of the contractor to complete on October 20, the certificate of the architect that it was not completed till 400 days thereafter could not be given binding effect, in view of the fact that the builder who completed the building, after the school district terminated the contract did not do the work under the contract but on a cost-plus basis.

Validity of Owner's Agreement to Pay an Increased Price

A very interesting and important decision was handed down by the Connecticut Supreme Court of Errors in the case of *Sasso vs. K. & G. Realty & Construction Co.*, 120 Atlantic Reporter, 158. It involved the question whether an agreement by an owner to pay more than the contract price, to induce the contractor to proceed, was enforceable against the owner. The owner claimed that it was not, under the fundamental rule that where one has already bound himself to do a thing it takes some new consideration to sustain a promise by the other party to pay more than the price originally agreed upon.

Plaintiff contracted to furnish marble and tile work for a building in course of erection by defendant, for the sum of \$7,800. Plaintiff

sought to protect himself as to the cost of materials by previously contracting with a third party for them. But the tile company with which he contracted failed to deliver, and plaintiff found that the materials had increased in cost. He therefore notified the defendant that he could not proceed unless defendant would increase the compensation provided for in their contract sufficiently to cover the increase in cost to him of the materials needed to perform his contract. Defendant, being desirous of having the work done at once, agreed to pay the increased amount, but later refused to pay more than the original contract price, claiming that there was no legal consideration for the modified agreement relied on plaintiff. The Supreme Court ruled that there was a mutual agreement for rescission of the old contract, and that there was sufficient consideration to support the new one, saying:

"The plaintiff claims that it appears from the finding that there was a consideration for such promises. It is immaterial that the promise made by the defendants to secure the completion of the marble and tile work on the building is called a modification of the original contract. What actually happened was that under the circumstances set forth above the plaintiff was, without fault on his part, in a position where he could not carry out his contract with the quality of tile contracted for. The defendants were confronted with an approaching breach of contract by the plaintiff. Instead of awaiting such breach and relying on an action upon the breach, they preferred to contract with the plaintiff to complete the contract with inferior tile costing more money than the plaintiff figured that the better tile would cost him when he made up his contract price. This constitutes a rescission or abandonment of the original contract and the making of a new contract which is based on a valid consideration, namely, the mutual promises there made by the parties. . . .

"If two persons enter into a written contract, which one refuses to fulfill, and the other makes a new contract with him, which operates as a rescission of the original contract, the new contract is founded upon a sufficient consideration."

Forfeiture of Bidder's Deposit Was Excessive

Where a bidder for state highway construction deposited more money with his bid than was required by statute, there was no right to forfeit more than the statutory amount on his failure to make the bid good, held the Washington Supreme Court in the recent case of *Harrington vs. State*, 213 Pacific Reporter, 449. The Court said:

"The statute . . . provides for a deposit 'equal to 5 per cent of the amount of his bid,' which shall be forfeited if the successful bidder fails to enter into a contract and furnish a bond. This, we think, is the limit a bidder can be made to suffer loss if he fails to enter into a contract and furnish a bond pursuant to his bid and as provided by law. In this case 5 per cent of the bid amounts to \$13,261.63, or

\$1,738.37 less than the \$15,000 the state declared to be forfeited."

Liability for Expense of Restoring Collapsed Work

If the walls of a building fell as a natural and probable consequence of negligent construction of the foundation by a subcontractor, he was liable for the cost of restoring the building to the condition it would have been in had he properly performed his contract. It was so decided by the Massachusetts Supreme Judicial Court in the case of *Hebbard vs. McDonough*, 139 Northeastern Reporter, 512. In the same case it was decided that the fact that the owner's supervising architect decided that the foundation had been properly constructed would not necessarily prevent the owner from enforcing claim for the cost of restoration. The Court observed that "the decision of the architect was made after the defendant had completed his work, and in no way had any influence upon the defendant in the performance of his undertaking."

Contractor's Failure to Comply with Contract Held Excused by Owner's Fault

Failure of a stone contractor to furnish shipments of cut stone within the time and in the order required by his contract was excused by the owner's failure to furnish plans and specifications within such time as to enable the contractor to fulfill his agreement. (*United States Circuit Court of Appeals, Eighth Circuit; Nebraska Stone Co. vs. Huron Lodge No. 444. B. P. O. E.; 288 Federal Reporter, 49.*)

Contractor Is Not Entitled to Substitute "Just As Good" Materials

Said the Appellate Division of the New York Supreme Court in the recent case of *Mississippi Shipbuilding Corporation vs. Lever Brothers Co.*, 199 New York Supplement, 377, concerning the performance of construction contracts in general:

"It cannot be denied that the universal holding in respect of recovery of damages upon an allegation of full performance of a contract requires that there be no material deviation from the requirements of the contract which affect substantially the nature of the construction specified; and where such departure from the precise terms which the builder has undertaken to carry out is wilful and intentional, such failure to perform the substance of the contract's requirements as indicated in its plans and specifications, is the basis for a refusal to give the builder a remedy of recovery. A contract is not substantially performed which substitutes for that which its requirements direct, materials and workmanship which expert witnesses may denominate 'just as good.' While minor deviations from the strict terms of a contract are permitted, where allowances are made adequate for the difference, if made in good faith and for sufficient reason, yet no ruling gives ground for extending this indulgence to material and substantial variance."

Laying Wood Stave Pipe

Contractors Need Experienced Men for This Work, or Should Consult Manufacturers

THE success of wood pipe of any type depends on the knowledge and experience of those who select the materials and manufacture them into the finished product. The first cost of high-grade wood stave pipe is as low as consistent with the cost of material and labor involved, and the maintenance is far lower than when pipe is made by inexperienced hands. In Volume 4 No. 7 of the *Journal of the American Society of Engineering Contractors*, George L. Watson, consulting engineer, says:

"If we merely look at photographs of the completed work, the building of a wood pipe line appears to be a very simple form of construction. Perhaps to some engineers and construction men it is. The writer is very chary about giving advice gratis, for what we get for nothing is not valued at much; but still a word of advice may not be amiss. The contractor

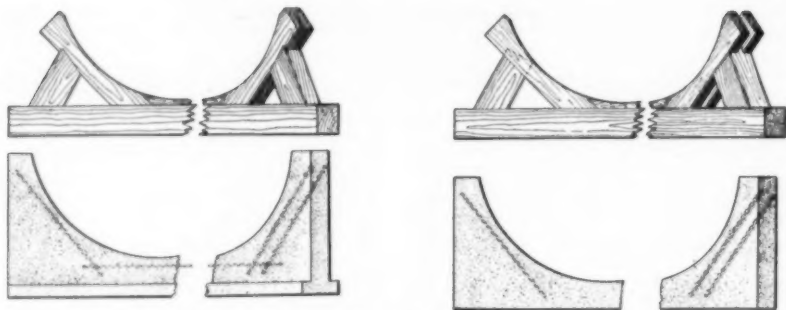
who is fortunate, or unfortunate, enough to be awarded a contract for laying a wood pipe line should first—and this is most important—get one of the stave manufacturers or wood pipe construction firms established in the West to bid a price for doing all the pipe work. At any rate, the experienced pipe constructor should first be consulted, and by doing so, the contractor who may be tempted to bid on work of this kind will often be protected against heavy loss."

Effect of Character of Soil

The character of soil in which wood pipe lines may be laid has no effect upon creosoted stave, but certain soils containing salts cause corrosion of the metal banding. Untreated pipe, however, should be laid in soil that will not adversely affect the wood as well as the banding. Earth containing vegetable mold,



LAYING CONTINENTAL WOOD STAVE PIPE FOR SERVICE AS A STORM AND SANITARY SEWER, IN WASHINGTON



DETAILS OF WOOD AND CONCRETE CRADLES FOR WOOD PIPE OR FLUMES

roots, grass or other unstable material should not be placed close to the untreated pipe. Loose rocks or boulders should not be permitted to come in contact with the pipe.

Wood, when untreated, may be laid on supports or cradles on top of the ground or buried completely under the ground. The cover should be of such a depth and character as practically to exclude the air from the outside surface of the pipe. Creosoted pipe may be laid either on top of the ground or under it, without regard to the character of the soil or the exclusion of air from the surface of the pipe.

Air Valves and Blow-offs

Pipe lines should be provided with air valves at all summits, or a decrease in the carrying capacity of the pipe will be observed, owing to the formation of air pockets. In distribution systems air valves are usually not necessary, inasmuch as the house connections, hydrants and other taps are sufficient to allow the escape of all accumulated air when con-

nections are made at the top of the pipe. Where silt is encountered in lines of any character, blow-offs should be employed so that accumulations may be readily and frequently removed.

Attention is called to the customary practise of placing a blow-off at the lowest point in the pipe line. This does not usually give the best results, for the accumulation of silt is carried by the velocity of the water to the bottom of the next rise beyond the low point. It is suggested that the blow-off be placed as above outlined and that a smaller vent be placed at the lowest point in the line in order to permit of emptying the pipe when necessary.

Experienced Help and Proper Tools for Laying Machine-Banded Pipe

While wood pipe can be well laid by anyone who will read the instructions carefully and use good judgment, it is to be desired that skilled workmen be put in charge of the work. A man who does nothing else but work of this kind can lay more pipe per day and lay it better than anyone inexperienced who has merely read



WOODEN CRADLES IN PLACE TO RECEIVE CONTINUOUS STAVE WOOD PIPE

the directions. In cases where the work is of sufficient extent to make it a matter of economy to use only experienced and capable help, a man can be furnished on a per diem basis by the manufacturer.

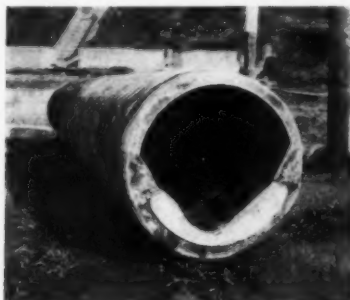
Tools required for laying wood pipe are few in number. Tongs are used to handle and lower the pipe into the trench. A driving plug made of wood with the end banded with iron to prevent splitting is furnished to fit the end of the pipe to afford a driving surface when driving up wood pipe. It is not always necessary to have the tongs for the handling of wood pipe, but the driving plug and maul should always be used.

For each gang of pipe layers when handling

paired without the sometimes great cost of finding the leak in buried pipe and opening the trench to make the point of trouble accessible.

Pipe Location

The introduction of Continental Creo-wood pipe made by the Continental Pipe Manufacturing Company, Seattle, Wash., has made it advisable to consider the question of proper location in two distinct manners, the reason being that untreated wood pipe is dependent for its preservation upon water saturation, while the creosoted pipe is not. Creo-wood pipe may therefore be laid without consideration as to whether or not it will be constantly full and under pressure, intermittently full and empty,



WOOD STAVE SPOIL PIPE BEFORE USING (AT LEFT), AND AFTER SIX MONTHS' HARD USE (AT RIGHT)

pipe in sizes from 2 to 8 inches inclusive, the following tools are recommended: one driving plug, one maul, and one pair light pipe tongs. For pipe over 8 inches in diameter, a larger driving plug and a tripod or wheel ram are recommended.

Backfilling Pipe

Too little attention is given to this important item, as it is frequently the practise to refill the pipe trench with material detrimental to any type of pipe. Rocks should not be left under the pipe or packed against it in the process of backfilling.

As far as possible, the material used in backfilling untreated pipe should be selected from a good character of earth. Vegetable matter, etc., should be cast aside. In backfilling, a finer material should be used under and around the bottom of the pipe and should be well compacted either by hand or by puddling with water. A coarser material could be used on the sides and top, and this should be well tamped in the most convenient manner.

Cradles

It is considered good practise, where possible, especially with the larger pipe, to make the erection on wooden or concrete cradles. This insures a proper support for the pipe and permits of inspection from time to time. Pipes of all kinds are subject to the development of leaks, and an exposed pipe can be quickly re-

or flowing partly full.

The location of untreated pipe affords more study, inasmuch as it should be so designed that it will be kept full at all times of the year. Where the lay of the ground will permit, it is considered good engineering practise to drop the grade of the pipe as quickly as possible from the intake to a grade from 25 to 50 feet, or nearly so, beneath the hydraulic grade line. This insures a pipe constantly full of water, and the saturation of the top staves as well as the bottom under pressure. Inasmuch as the cost of wood pipe is dependent upon the amount of metal used in banding the pipe to resist the internal pressure, the head selected for the establishment of the grade may be economically taken as the minimum head for which a pipe is banded. This ranges, depending upon the size, from 20 to 40 feet in the continuous stave type to 50 feet in the wire-wound type of pipe.

In localities where the upper end of the pipe line cannot be laid so that the pressure will be maintained, the pipe may be made of creosoted material, while the lower end may be economically laid with untreated pipe. In the case of irrigation or supply systems or any other kind, it is frequently found more economical to run across a valley, a gully or even a slight depression with an inverted siphon, rather than follow the contour in the manner which would be necessary were a ditch used.

The Use of Wood Pipe for Sluicing and Dredging

Wood pipe has been used successfully for sluicing purposes in various places, for conveying earth and gravel washed down by the hydraulic process into waste banks and fills, and for filling low lands by pumping.

For dredging purposes, it is especially well adapted. Where used on land, the standard wood coupling with individual bands is employed. This permits the joints to be readily taken apart and put together again in a different location. When used on pontoons where flexible joints are required, a form of rubber or canvas sleeve is employed. When worn at the bottom, wooden dredging pipe can be turned one-quarter way and each pipe section used

four times. The frictional resistance is small and there are no rivet heads to wear off and permit the pipe to break apart. The standard thickness of shell is provided unless attention is called to an unusually heavy or abrasive character of discharge.

Wood spoil pipe is especially designed to carry heavy sluiced material. The blocks in the bottom, when worn out, can be quickly and easily replaced with new ones, and the pipe is then just as good as when originally made. The joints are connected by means of wood collars, bound together by individual bands. These can be quickly removed and replaced. The blocks can be purchased from the manufacturer or where the pipe is intended to be used.

Evidence of Economy in Bridge Construction

SIX wooden bridges were constructed in the latter part of 1917 on a 3-mile stretch of highway between Gautier and Pascagoula, Miss., a region abounding in marshes, bayous and rivers, the waters of which are salty nearly all the year. These bridges have been in constant use since erection, and have remained in practically perfect condition with the exception of the 3- by 6-inch heart pine flooring, which was the only part untreated. Twenty-five per cent of the flooring has already been replaced, and Superintendent Vaughan, of the Louisville & Nashville Railroad Company's treating plant at Gautier, reports that renewal of the remainder will be necessary within 60 to 90 days. The new floor will be built of 3-inch creosoted plank, covered with 3 inches of asphalt, which means a saving of time and money, for the

next generation at least, that can be devoted to road building, since these bridges will then be constructed entirely of treated timber, making additional expense unnecessary.

For the construction of these bridges, which are from 200 to 2,100 feet long, 750,000 feet b. m. of lumber were used, consisting of caps, stringers, bracing, guard-rail and banister, in addition to 1,000 piles, 18 feet to 60 feet long, all treated with 16 pounds of creosote per cubic foot.

An average traffic of over 200 vehicles passes over these bridges each day, consisting of everything on wheels—trucks, tractors, road-rolling machines, and touring cars—and the service being given by the bridges substantiates the claim that treated timber is a profitable investment.

—Wood Preserving News.

The Turnover Tune

Said the clock to the dealer,
To the dealer and his stock,
"I am ticking off your profits,"
To the dealer said the clock.
"Custom, custom every minute!
Luck is in it—luck is in it!
Where's the risk when trade is brisk!
Tick-tock! Tick-tock!"

"You're a liar, you're a stealer,"
Said the dealer to the clock.
"Ticking up my carrying charges—
Making mock—making mock!
Fractions up to dollars mounting
Till they leave my profits nil;
Just reversing my accounting!
Stand still—stand still!"

Oh the goods we bought so gaily
And the goods that will not go!
Adding costs forever daily
Till we tear our hair with woe!
Moods and tenses of expenses
On the poor retailer's stock—
And that devilish little revel
'Twixt the profits and the clock!

—William R. Benet in *The Nation's Business*.

Submarine Pile Driving

Foundation for New Power House of Brooklyn Edison Company Built in Record Time with Great Economy

THE resident of a large and noisy community would pay but passing interest to a pile-driving job with all its chatter and bang, but the sight of a steam-pile hammer submerging itself while driving in 40 or 50 feet of water would doubtless attract more than ordinary attention. Many prominent engineers have journeyed over to the Brooklyn waterfront to watch the performance of the submarine pile hammers which the Frederick Snare Corporation used on the waterfront foundation of the Brooklyn Edison Company power house. Those of the engineering profession who watched the unique performance of the submarine pile hammers agreed that it was a radical departure from the older practise and in practically all such work was certain to make pile-driving for subaqueous foundations a simpler and cheaper operation than it has been heretofore.

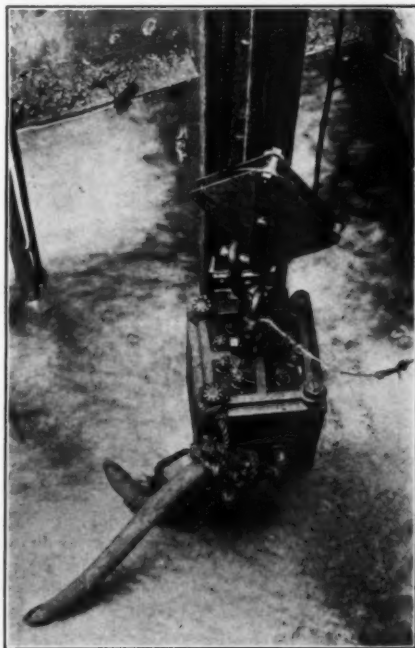
The waterfront foundations were erected within 11 steel pile coffer, of which only 2 or 3 were unwatered prior to driving the foundation piles within them. In 8 of the cofferdams the timber piles were cut off with a power-driven pile saw and in some case it was necessary for divers to do the sawing at almost prohibitive cost. In the three outermost cofferdams the depth of water was from 30 to 45 feet and in consequence of the heavy pressure unwatering was deemed to be impracticable.

The steel piling of which the cofferdams were built and the foundation piles in the eight coffer previously referred to were all driven with five McKiernan-Terry 9B pile hammers. Two of the 9B pile hammers were fitted up by the manufacturer for submarine driving. This was done by attaching a special base to the hammers and a fitting on the lower cylinder for connecting a small hose through which compressed air at low pressure was introduced to keep out the water and prevent it interfering with the operation of the ram. A steam hose connected to the exhaust port of the hammer was kept well above the surface. In this manner the hammers drove under water equally as well as they did on land. The operation of the submarine hammers was assisted materially by a special driving spud designed by the engineers of the Frederick Snare Corporation. The spud was a 12- x 2-inch timber 55 feet in length to which a T-rail of the same length was attached. A carriage composed of a steel channel about 15 feet in length, with two Z-bars arranged to form a slot for the head of the T-rail to slide in, was riveted to the channel. Two larger Z-bars were secured to the back of the pile hammer spaced to slide freely over the flanges of the channel or carriage. A stop at the top of the carriage and another at the top of the spud prevented the pile hammer and carriage from becoming disengaged from the spud.

The spud, carriage and pile hammer were raised by a single line attached to the latter. At the bottom of the carriage was a toe piece in V-shape made from steel plates. The toe piece was drilled with holes large enough to admit a tie spike. A locomotive crane with a 60-foot boom and 2 lines, one for the spud and one a pile line, was used for most of the work. Steam for operating the pile hammer was furnished by the boiler on the crane, and compressed air for the lower hammer cylinder was taken from the line furnishing power for pneumatic tools used in erecting the steel for the power house.

The pile-driving work was done inside the bracing of the cofferdams. The timber piles had steel shoes and were from 15 to 25 feet in length, 12- to 14-inch butts, and were driven on 2-foot centers their full length in a compact sand and gravel bottom.

The pile hammer and its carriage were raised to the top of the spud and the latter raised off the bottom. With the pile line the crane brought the pile into position in the bell-shaped anvil block of the pile hammer and in between



GOING DOWN!



PILE, PILE HAMMER AND CARRIAGE READY FOR A SUBMARINE TRIP IN CONSTRUCTION OF
BROOKLYN EDISON COMPANY'S NEW POWER HOUSE

the toe piece at the bottom of the carriage, where it was securely held by two spikes driven through the holes of the toe piece into the pile.

The pile line was then cast off and the spud maneuvered for the location of the pile and brought to rest on the bottom. The spud was then guyed in a vertical position and the carriage with pile hammer and pile was lowered to the bottom. All piles extended at least 2 feet beyond the lower end of the carriage. With the first few blows of the hammer the spikes which temporarily held the pile in the toe piece were disengaged and the pile thus made free to descend under the action of the hammer. The piles were driven to grade in about 6 to 10 minutes after the pile hammers started working, though the contractors state that some of the driving which they timed consumed only 6 minutes, including the time of setting the pile in position in the carriage, driving and raising the hammer for the next operation. In the manner described more than 3,000 piles were driven by the submarine hammers in three cofferdams.

The contractors state that the driving under water averages well with similar driving on the surface.

Divers who inspected the work reported that the piles had been driven to grade without being broomed and were accurately spaced. After inspection concreting was started, as no pile sawing was necessary. By this method of driving the contractors say that the total cost was less than the former cost of sawing alone.

With the submarine pile hammer followers are not used. Engineers have always been averse to the use of followers, as the bearing value of piles driven with them could not be definitely determined. If they got out of alignment with the pile, they would deflect it from the vertical and, moreover, the energy of the hammer's blow was cushioned considerably by

the follower before it reached the pile, thus wasting power.

Another advantage of the submarine hammer is that there will be only occasional need for pile saws, which are expensive to rig up and operate. Heretofore when long piles were driven from the surface the top, or the best part of the pile, was cut off, but with the submarine hammer the piles can be driven so close to grade that in most cases no sawing will be necessary. When they do have to be sawed the cut-off will be a very short section, so the top of the pile will be practically the same diameter as it was before driving.

To summarize the advantages of the submarine pile hammer as viewed by the work described, it seems reasonable to state that shorter piles can be used with less waste of timber, the follower is dispensed with, the full force of the blow is delivered to the pile, the bearing power may be determined as on the surface, the piles will be driven straight and accurately spaced, high water need not delay driving, divers are required only for inspection and occasional sawing, and such sawing as is necessary will be easy, as only short sections will have to be cut off.

The power required to operate the submarine hammers is the same as on the surface, the number of blows of the submerged hammer is the same as above water, and the volume of compressed air needed to keep the lower cylinder free of water is small, the pressure being only half a pound for each foot of submergence.

In conclusion, it would appear from the demonstration just made that piles can be driven under water almost as easily as on land and that future subaqueous foundations may be designed with the knowledge that the pile-driving operation may be carried on under water quickly and economically.

Law Now Requires Day-Labor Costs in California

ADVOCATES of force-account construction have an opportunity in the new Breed day-labor law in California to demonstrate their long-urged claim that work done directly costs less by the amount at least of the contractor's profit. By this new legislation all persons proposing to perform public work by day labor are required to file accurate plans and specifications, to record the names of bidders and the prices bid, and to report complete costs of the work and all changes from the plans and specifications on file. In the past most argument for or against force-account work has been inconclusive because no cost measure was available for comparison with contract prices. It has been shown in numerous cases, and particularly in the investigation by Leonard Metcalf and Harrison P. Eddy a decade ago into Boston city-force-account construction, that rarely are all cost items included in the records. On the other hand in such undertakings as the

Panama Canal and the Los Angeles aqueduct, both built largely by day labor, there is reasonable evidence that the method was as cheap as any other, and, in addition, the administration difficulties were greatly reduced. There is such allurements in the thought of eliminating the contractor's profit that popular support can be had to almost any proposal to build public works by day labor. It is hard for contractors to meet this situation by argument, because whatever they urge is regarded as prejudiced and, as already said, no costs are available against which they can oppose bidding prices. The new California law puts no obstacles in the way of day-labor methods, but it does demand that the people shall be told how much they cost as compared with prices for which contractors were willing to perform the work. Contractors have every reason to be gratified with the new legislation.

—Engineering News-Record.

New Hydroelectric Power Dam on the Tallapoosa River, Alabama

Ten-Million-Dollar Development Under Way by Alabama Power Company, Birmingham, Ala.

ACCORDING to a recent announcement by Thomas M. Martin, President of the Alabama Power Company, Birmingham, Ala., work on the hydroelectric power dam at Cherokee Bluffs on the Tallapoosa River will be begun at once. The total cost of the development will approximate \$10,000,000.

The dam will be 120 feet high and 800 feet long, with an initial capacity of 88,000 horsepower and an ultimate capacity of 132,000 horsepower. The dam will form a reservoir of 22,500 acres, and 25,000,000,000 feet of water will be impounded, forming the largest expanse of water in Alabama. Approximately 200,000 cubic yards of concrete will be used in the construction work.

According to O. G. Thurlow, Chief Engineer of the Alabama Power Company and its subsidiary, the Dixie Construction Company, it will require 2½ years to build this dam. The structure will follow the type popular in western states, but little employed heretofore in the South, the power-house being built below the dam instead of as an integral part of it. The water will be conveyed to the wheels through penstocks leading from the dam above. There will be three units of 44,000 horse-power each.

A thoroughly modern and sanitary camp will be erected at the site to house employees and their families. It will afford accommodations for 3,000 people. A water-supply system with a modern filtering plant and sewerage connections will also be built, as well as a modern hospital, a recreation hall, a motion picture show, and a commissary. The average daily pay-roll will amount to about \$4,000.

The Tallapoosa River, on which the site is situated, is a non-navigable stream, and with the Coosa forms the Alabama River near Montgomery, Ala. On account of its relation to navigation on the Alabama River, the development is under the jurisdiction of the Federal Government. Provision will be made for storing flood waters, and the plant will be operated in conjunction with other power developments of the Alabama Power Company in the same region, so as to use the stored waters in times of drought.

The new dam will make 28 miles of the Tallapoosa River navigable, and will have the effect of increasing the minimum flow of water in the Alabama River for navigation purposes, giving a 4½-foot navigation stage on the Alabama River up to Montgomery throughout the year. The stream flow of the river will also be regulated to such an extent that floods will be greatly reduced in the Tallapoosa and in the upper reaches of the Alabama, thus safeguarding one of the richest agricultural sections of the state from overflow.



SITE OF DAM FOR TALLAPOOSA RIVER DEVELOPMENT OF THE ALABAMA POWER COMPANY, BIRMINGHAM, ALA.

Quality standards are essential for the free interchange of commodities in commerce beyond the stage of first-hand transactions in which personal observation and opinion govern. Progress in civilization is measured by commerce. Standards are at the base of civilization.—F. W. Kelley, President, Portland Cement Association.

Saving Money in Handling Materials

By O. H. Kneen

Engineer, Seattle, Wash.

THE contractor who has not studied his handling problems carefully, letting "George" do his handling at dollars per hour, is thereby adding to all three of his cost factors—labor, material, and overhead. Labor spent in avoidable handling is not available for more productive work; the cost of material is the "cost on the job"; and the contractor's overhead expense is always burdened with large costs for transporting, moving and handling.

The two elementary principles of handling materials anywhere are: first, perform only the handling operations that are absolutely necessary; second, perform these operations at the lowest possible expense. Contractor Jones says he leaves it to his truck driver and the "bull gang" to deliver and handle his brick, lumber and odds and ends. Contractor Smith, the "lucky" bidder on many a big job, spends nights, Sundays and holidays figuring how to save handling his materials more than once; how to deliver as close as possible to the point where the material will be used; how to utilize chutes, carriers and every conceivable method to cut the amount and cost of handling. On his biggest job, which had none too comfortable margin, he even employed an expert for two weeks, to do nothing but lay out his drive-ways, elevators, and runways, and, in fact, to figure the most economical method of delivering every major item which went into the building. The saving was sufficient to convert an uncertain job into a handsome-profit affair (that elusive goal of all optimistic contractors).

It requires no argument to show the necessity of saving truck-hours. Whether you support your own gas-wagon, or contract your transporting, the mounting costs of moving by gas are all too evident. If you can devise ways and means of decreasing the idle time of one truck by an hour, you will have saved approximately the cost of one laborer. The very fact that no two jobs are the same, makes it that much more important to take time and figure carefully on your materials: where they are to be used; where they can be stored to advantage; and how they can be landed at the point of utilization for the lowest cost.

Take materials for concrete, for example.

The writer watched a gang of laborers recently wheeling sand and gravel some 80 feet to a mixer. They almost trod on each other's heels; they were supplied with ancient "Irish buggies," and the final cost of landing those materials in the mixer was something which only a "cost-plus" contractor could view with equanimity. In the first place, the materials could have been easily delivered next to the mixer, if there had been a planning head in charge; that would have saved a large part of the cost. When we must carry gravel, sand, or concrete mix, the new two-wheel push-cart type of barrows are so valuable in saving time, labor and cost, that there is no choice when new equipment is needed.

Do not be backward in obtaining information on handling materials. From engineers, contractors, magazines, advertising pages, and every available source, ideas may be garnered which mean savings. It is often much easier to save a thousand dollars on a job under way than to land another job which will net half that amount, because in the first case you are figuring against a certain figure which was estimated to yield a profit with ordinary methods, and it is morally certain that time spent in devising handling methods will save money over the original estimate.

Study the Methods Used on Other Jobs

It is the small-job man, of course, who has the greatest problem as to equipment. He cannot afford to invest in expensive mechanical equipment which may absorb all his earnings on one job and be unsuitable for the next six jobs. Yet if he tries to do all handling by good old arm-strong methods, he is unable to bid against better-equipped competitors.

For this large class of the nation's builders, it is recommended that careful study be made of other jobs and the methods developed; that inexpensive chutes, brick carriers, and similar items be provided where needed; and every effort be exerted to keep the trucks "on the move." Keep one good man on the receiving end, who is competent to tell how, when and where to put it, and is equipped with originality. Very likely it will be found that more money can be saved here than in actual erection.

Contact with others in your line is one of the best-paying investments which can be made. In meetings, conventions, and casual talks with friends, many a valuable tip can be picked up, its worth being reflected eventually in the bank balance. Then the trade journals and magazines are often regular gold mines of ideas. It is unlikely that you are the very first to solve any particular problem of handling; some man down in Texas may have hit upon the very plan you need to pave that street with something beside gold.

In almost every thriving community there are factories which have developed unique and

time-saving methods of handling materials. It would pay every contractor to go through some of the larger and more modern factories, with their useful hand trucks; platform trucks, where the platforms are loaded and then elevated by a small truck and moved quickly to another point; conveyors of every description—belt, bucket, scraper, portable, pneumatic, etc.; cranes, chutes, hoists, elevators, lifting magnets, and every imaginable device to assist men to transfer raw and processed materials. Not all of them are expensive; many can be duplicated for contractors' use at small expense.

Here are a few suggestions on general unloading and handling. While it is important to save truck-hours, do not unload where you will have to handle again, if it is at all possible to deliver to the point of utilization. A few minutes more may save many dollars' worth of time. Stack small articles in bins, boxes, or on platforms which can later be handled as a unit. Strong boxes on truck wheels are wonderfully effective where runways are available. It requires little more time or effort to pick up five bricks as against one; the saving may be 80 per cent of the total cost of unloading your brick. Tossing brick or tile from one man to another may appear dexterous, but often-

times a chute will cost less than half as much to use.

Keep plenty of snatch-block, pulleys, and ropes on hand; they can be rigged up quickly, and no device of modern man has done so much to facilitate the moving of heavy materials. The humble little electric motor isn't half appreciated or utilized; with an assortment of pulleys, grinding wheels, and such equipment, a 2-horse-power motor should be as good as two men on most jobs. Don't let any man pack materials on his back if they can be moved any other way, especially if there is a considerable quantity to move. Gravity will work just as well for you as it did for Newton some years ago. That apple landing on his head started his wheels to turning, and that is exactly what the modern contractor needs. It is a continual race between the mounting cost of doing things by hand, and the devising of mechanical assistants to save labor. Many items of mechanical equipment which were extravagant in the days of two-dollar common labor, are absolute necessities with four- or five-dollar labor; for it is the total investment which largely determines the amount of building being done. Likewise, savings made now yield greater returns than heretofore; our brains pay larger dividends.

Should a Maintenance Guarantee Be Required?

Necessary on New Types of Pavements, But of Doubtful Value with Tested Types Laid by Reliable Contractors

IN a paper read before the League of Texas Municipalities by W. J. Emmons, Professor of Highway Engineering, Agricultural and Mechanical College of Texas, there is an interesting discussion as to whether maintenance guarantees from contractors are justified.

Professor Emmons says:

"In many cases, the contractor is required by the terms of his agreement with the city to maintain his pavement in good condition for a period of five years following completion. The theory is that the contractor will do his utmost to guard against the necessity of repairing, and thus the city is protected against the danger of slipshod and careless work. In the days when comparatively little was known of paving materials and methods and when skilled and reputable contractors were scarce, this plan of safeguarding the public's interest was probably justified. At present, however, the inclusion of the maintenance clause is of doubtful expediency, except perhaps when new and

unproved types of pavements are adopted.

"An incongruous situation is developed when, as is usually the case, the contractor is asked to guarantee the success of work constructed in accordance with the engineer's rather strict specifications, and particularly so when rigid city inspection is also provided to regulate the many details of the work. This latter seems decidedly to be the more logical and better form of protection, but it certainly must be intelligently applied if satisfactory results are to be obtained. A properly laid pavement should require but little outlay for the period of the guarantee, and a pavement which does require extensive patching will also certainly deteriorate at an accelerated rate immediately after the repairs are completed, and will be a bad investment. Thus, why not abide by carefully drawn specifications, enforced by good inspection, and save in first cost the guarantee charge of 5 cents per square yard which the contractor must charge in self-protection?"

To Standardize Cement Mixers

A COMMITTEE headed by General R. C. Marshall and composed of two contractors and two members of the American Society of Mechanical Engineers, has been appointed and given a very definite program in the standardization of cement mixers. This is an outgrowth of a larger committee on

standardization whose chairman is Clarence E. Bement, Novo Engine Company, Lansing, Mich. The work of this committee, which started the latter part of May, will undoubtedly result in such gain in efficiency that it will save in construction and, especially to contractors, much money and much worry.

Manufacturers ---- Distributors ---- Consumers

Published under the auspices of the Associated Equipment Distributors, Sixteenth Street Viaduct, Milwaukee, Wisconsin.

EDITORIAL NOTE:—In establishing this department under the auspices of the Associated Equipment Distributors, it is the aim of the publishers of *CONTRACTORS' & ENGINEERS' MONTHLY* to promote the welfare of the contractor through a better appreciation of the aims, ideals and tribulations of the manufacturer and the distributor. The contractor as the consumer is the base of the triangle supporting the manufacturer and the distributor. These two are dependent upon the good-will and buying power of the contractor or the municipality for their continuance in business. Their aim is to serve the contractor in the best manner possible; the distributor through securing the agencies for lines of equipment which he believes will serve the contractor in the best manner; and the manufacturer through producing reliable equipment and choosing dealers who have the welfare of both consumer and producer at heart. The discussions of construction and distribution problems from all three sides of the triangle will be published from month to month in this department under the auspices of the Associated Equipment Distributors and by manufacturers and contractors whose expressions of opinion will be sought.

The Reliable Equipment Distributor

By K. B. Noble

President, The K. B. Noble Company, Hartford, Conn.; President, Associated Equipment Distributors

ALL that may be set forth in this and in future monthly articles written under the auspices of the Associated Equipment Distributors will reflect the collective thought of a body of successful business men who have spent the best years of their lives in close touch with every situation involving machinery and equipment and its application in every allied contracting field. We further hope to be able to present to the reader reasonable facts pertaining to the handling and marketing of construction equipment, showing that because there are involved big risks, diversified and specific engineering knowledge and, as a general rule, heavy investments, it is only through the legitimately established distributor that the contractor's interests in the selection of construction equipment and its proper application, maintenance and service can best be safeguarded. Thus exposing the aims of our Association, it is hoped that the reader will view with discernment and fairness the thoughts which actuate the articles and will find underlying each expression and statement a real, definite and constructive message, with the purpose of harmonizing the many associated and intricate problems among the contractor, the distributor and the manufacturer, whose joint interests are indisputably identical and, as it might be expressed, "one for all and all for one."

The membership of the Association is composed of men whose business, thoughts and ideals are harmonized in one big object—that of stimulating by close contact the better ideals and principles of their business, of interchanging invaluable ideas and plans for systemizing and bringing to a higher point of efficiency their different departments, and of encouraging among

their members a broader conception of service and consistent expansion along the right lines.

The carrying out of these ideals must surely be stimulating to the contractor and encourage on his part more careful investigations into his equipment purchases and the source of his supply, and a better understanding and a clearer conception of the sound axiom that "it is not the price you pay, it is what you receive for the price that counts."

The distributors are further vitally interested in bringing closer harmony between the manufacturer and themselves, thus making it possible to more closely cooperate with them in an interchange of those profitable field experiences and suggestions which go toward increasing the efficiency and bettering the design of the manufacturer's product.

Admitting the contractor as the "prime mover," very frequently the judge and the jury, it can readily be realized that if, through these articles, which will cover a wide variety of subjects, we can bring before him ways and means of intelligently removing or minimizing his risks and obstacles and assist him in placing the purchases, service and use of construction equipment on a basis of greater reliability and permanence, and can also give him a clearer knowledge and understanding of the problems of the distributor, their individual responsibility both to him and to the manufacturer, the relative position of the organized equipment distributor will be strengthened in the eyes of the contractor, his respect for the distributor will be greater, and the manufacturer will, in turn, view his particular distributor in a new light of clearer understanding and sympathy. If these things can come to pass, it will mean a

higher standard of purchases, a better conception of values and a clarified interpretation of service.

The Long Pull

The fundamental rules of the successful equipment distributor's organization are expressed by "Service to the Contractor." In every branch or department of this business is involved the inseparable meaning of service.

Service should not be misunderstood to represent simply a repair man when in trouble or an adjustment on a disputed claim. Its meaning is bigger and broader, and should logically apply as a whole and be properly defined as a unit idea. Service, then, is the embodiment of many correlated principles. It is *capital resources*, ability to buy wisely (close to the market), to buy substantially, and to carry an adequate new stock and abundant repairs.

It means *prestige*, which signifies that the distributor must be in a commanding position of annually renewing the most advantageous machinery contracts or securing new accounts involving superior equipment from the most progressive and leading manufacturers.

It means ability and sound judgment in engineering, and field experience in making recommendations which ultimately result in peace of mind to the contractor. It means ability to analyze two or three products and select the

one whose mechanism, whose design and permanency of construction are more sound and more practical than another, irrespective of costs. It means courage to be steadfast in always adhering to the higher-quality lines in which sales will tend to build up the distributor's reputation for reliability and judgment long after the price is paid and forgotten.

This composite illustration of the meaning of service and its inestimable value to the contractor can only be brought home by a clearer understanding of what the better class of construction equipment houses are accomplishing and have accomplished in the years past and why they should be given your whole-hearted support. The "curb broker" who can afford only to meddle with second-rate machinery and manufacturers, who quite invariably compete by price cutting, should be discouraged. He is here to-day and gone to-morrow like the mushroom, without a true message of permanency or service, and in selling, purposely or inadvertently, assumes obligations he is unable and unqualified to fulfill or maintain.

The first leading article will appear in the September issue of the CONTRACTORS' & ENGINEERS' MONTHLY under the title, "Buying Methods of Contractors—Cause and Effect—as Viewed by the Distributor," by William H. Ziegler, President, Wm. H. Ziegler Company, Inc., Minneapolis, Minn.

Concrete Floor Tests

Veteran's Bureau Building Able to Carry Its Burden

THE hollow tile and reinforced concrete floors of the Arlington Building, Washington, D. C., occupied by the United States Veterans' Bureau, were recently tested by loading them and measuring the deformation. In building this structure, the tiles were placed in rows and spaced 4 inches in each direction. Reinforcing steel was placed in these spaces near the bottom of the slab in the panel and near the top of it across the supporting beams. The concrete was poured around the reinforcing bars and into the open ends of the tiles.

The building was intended for a hotel but was later turned over to the Government for the use of the Veterans' Bureau. The original design load of 75 pounds per square foot was increased to 100 pounds per square foot, and the increased strength was obtained by a 2-inch layer of concrete over the tops of the tiles.

The panels of the floor were loaded with sand bags up to 380 pounds per square foot and the

stresses in the steel and the concrete measured. The maximum stresses developed in the steel reinforcement were about 27,000 pounds per square inch and those in the concrete about 1,600 pounds per square inch. The effect of time under load was to increase the stresses in the reinforcing steel from 15 to 20 per cent. This was particularly pronounced in the first 20 hours and was comparatively small later.

The panels tested varied in the ratio of length to width. It was found that with the increase of that ratio, the stresses in the reinforcing steel at the bottom of the slab and those at the top of the slab (across the girders) increased in the direction of the short span and decreased in the long one. The stresses in the girders were lower than those in the slab.

The factor of safety of the structure was greater than two. This factor is the ratio of the maximum load the structure can sustain to the load which can be safely allowed when the building is in use.

Two Well-Known Organizations Move Quarters

Eastern Clay Products

The Eastern Clay Products Association has announced the removal of its offices from 910 Penn Square Building, Philadelphia, Pa., to 906 Colonial Trust Building, Philadelphia, Pa.

Larger Quarters for Dallett

The Thomas H. Dallett Company, Philadelphia, Pa., has announced its removal to 165-89 West Clearfield Street, Philadelphia, Pa., where increased facilities will improve service.

Building to Last, Not to Burn---Part I

The Story of the Work of the Underwriters' Laboratories in Determining the Fire-Resisting Qualities of Different Building Materials

A CURRENT joke among New Yorkers before 1897 was that the only fire-proof building in the city stood on the corner of Fifth Avenue and Forty-Second Street. If curiosity prompted one to investigate he would find the "fire-proof" building to consist of the reservoir—a massive stone wall enclosing and impounding 24,000,000 gallons of water.

The reservoir was demolished at last to make way for the Public Library, and the question as to whether New York now has even one completely fire-proof building is open to debate. Certainly many buildings are more or less fire-resistant, but a much greater number seem to burn so readily as to suggest that the city's streets are lined with thousands of prepared bonfires, awaiting only the touch of flames.

This is also true in all other American cities and towns, and with the usual run of country buildings, but it is conspicuously untrue with regard to many foreign countries. Indeed, the contrast between fire losses in America and in Europe is so striking as to indicate the existence of very fundamental reasons which, on investigation, prove to be threefold, viz.: our traditional American carelessness as compared with the thrift and precaution of an older civilization; our larger employment of hazardous devices and, chiefly, the highly combustible character of our buildings.

It is but a few generations since our forefathers found themselves on a new continent abounding in forests which offered an apparently endless supply of inexpensive building material. It was inevitable that frame construction should come into general use, and it was a natural consequence that fires should be-

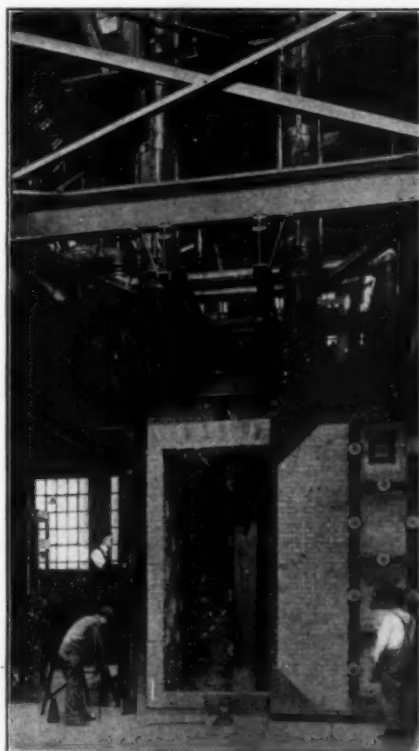
come so frequent that Americans looked on them as more or less matters of course—"acts of God"—although better-built Europe did not so regard them. Characteristic American optimism was willing to "take a chance" in the matter of fire hazard, but the results finally grew sobering, even to optimism. Then it was realized that buildings must be built to last, not to burn, and architects and engineers gave

a very tardy recognition to the importance of the subject of fire prevention.

Before long they found themselves handicapped by lack of information. They knew that a single brick or block of stone would not burn, and assumed that a building of brick or stone would not burn, but were distressed to find that such buildings often proved to be fire-traps. Apparently it would be necessary to master other factors before fire-proof or even fire-resistive construction could be thought of. This was a matter of life and death to thousands, and of vast property values. How, then, might this knowledge be obtained?

The study of conflagrations revealed much, but the results might be misleading because of the uncertain conditions of the fire. After each big fire, manufacturers were stimulated to produce new forms of roofing, partitions and other structural material which were confidently labeled "fire-

proof" until another fire showed otherwise. Finally it came to be realized that there was no possibility of checking the nation's mounting fire waste unless severe fire conditions could be produced under control and under expert observation for the purpose of testing and determining the qualities of various building materials before they were actually employed.



COMBINED FURNACE AND HYDRAULIC RAM FOR TESTING COLUMNS UNDER A HEAT OF THE INTENSITY OF A CONFLAGRATION AND UNDER LOAD

Studying Burnable Conditions

"Underwriters' Laboratories" began this work in 1903 and it soon grew into one of the principal activities of the institution. The tests of building materials have included a great variety of products representing thousands of different manufacturers, and the Laboratories' influence is felt in the whole field of building design and construction. Probably generations must elapse before American towns can be rebuilt along safer lines, but the steps already taken in that direction are appreciable and many of these steps are directly traceable to tests conducted on East Ohio Street, Chicago.

The subject of building material tests is well worthy of a close view, and a glance will now be given at some of its subdivisions.

Roof Coverings

Most conflagrations are associated with wooden shingle roofs. The original fires may be due to many causes: to Mrs. O'Leary's cow (if this famous animal ever really existed); to shoe-heel lacquer in a Salem workshop; even to the overflow of a river causing the sudden slacking of lime in a Georgia basement. In most cases, however, the fire is trifling until it begins to travel, and its favorite method of travel is from roof to roof.

A general conflagration is a terrifying thing. The word calls to mind great clouds of acrid smoke, a roaring advance of wind-driven flames, and a rain of flying sparks and brands upon the roofs in its pathway, so that these latter sometimes begin to burn blocks ahead of the main fire. With it all, there is the panic-stricken activity of the threatened inhabitants rushing to escape or to save what they may of their possessions. A conflagration is the most dramatic event in American city life; it is of all-too-frequent occurrence, yet it is almost unknown in European cities with their solid buildings and their slate, tiled or metal roofs, upon which sparks or brands merely burn themselves out.

But America is a land of wooden shingle roofs—millions of them; they are a tradition of our history because they are cheap, easily applied and easily repaired.

However, the accumulated lessons of fires became so unmistakable that, rather less than 20 years ago, there developed a great demand for durable, inexpensive, fire-resistant roofings to replace the wooden shingle.

Demand is usually followed by supply, and soon manufacturers produced various forms of roofing that were marketed as "fire-proof." In actual fires, these did not always substantiate this claim, and the underwriters, by whom roofing is regarded as an important element in influencing the spread of fire, realized the need for exact knowledge on such a vital matter. As soon as the question of roofing began to affect insurance rates, both users and manufacturers saw the necessity for an authoritative judgment, and Underwriters' Laboratories, in 1906, began making roofing material a subject

of test and classification. At first the tests were rather crude, the principal one being the dropping of red-hot cast-iron discs on the roofing samples. Nevertheless, so carefully were the observations made, that there has been no instance in which labeled roofing, in use, has failed to fulfill the requirements of its classification.

Ultimately, the investigation developed into its present form, in which a careful and standardized study is made of various questions of design, construction, practicability, durability and other items, as well as of the direct question of ability to resist heat and flames.

The items in the resulting report represent a great deal of work. For instance, "Physical Tests" really includes also some thorough chemical tests. To the untrained eye, there is little difference between a piece of rag-felt roofing saturated with coal-tar pitch, and a piece of asbestos-felt roofing impregnated with asphalt, but they have different properties. Even the word "asphalt" is not sufficiently definite, because there are asphalt deposits in Trinidad, Utah, and elsewhere, from which many varieties are extracted, each of which has certain properties, and the various manufacturers have formulas of their own for mixing their saturants, impregnating compounds and coatings. The Laboratories must know just what the test samples consist of, so that year after year it may check up on the manufacturer.

The fire tests are threefold. Frequently roofing encounters severe heat without being touched by fire-brands, and sometimes bursts into flames from the heat alone. This is tried out in the first test, in which a drum-shaped gas fire oven is heated until the bottom plate glows red at 1,100 degrees Fahrenheit. Then the roofing, which is laid on a wooden deck as in use, is moved to within 10 inches of this plate and is subjected to the heat until flames appear on the underside of the deck. Everything is standardized, as in all other tests, in order that each make shall be tried under the same conditions.

The next test involves burning-brand exposure. A standard brand is ignited, placed on the roofing sample and allowed to burn itself out. Some roofings fail under this test, as is shown by the burning of the roof boards; with others, the boards are uninjured. Every detail is recorded carefully and photographs are taken.

Then comes a more severe exposure—that of wind-driven flames. This is really spectacular, for a roaring mass of flame, impelled by a 12-mile wind from a blower, leaps from a 36-inch burner and attacks the surface of the roofing. This test continues until the roof deck boards are ignited. The time is noted, as well as the rate of the spread of flame over the roof covering during the test. The blower, by the way, is used in connection with the other tests, and the 12-mile rate was determined upon after studying the weather reports of many years.

When roofing has undergone these and still

other ordeals and has been recorded and photographed, there is no longer room for guesswork as to the claims of its manufacturers; its fire-resistant qualities are known, and the classification label awarded to it by the Laboratories shows exactly what can be expected of it by the public.

Windows

On the night of March 15, 1922, the upper eight floors of the Burlington Building in Chicago were swept clean of their contents in a great fire that involved fourteen buildings. This fire caused much discussion because of the fact that the Burlington Building had been considered a fine example of modern fire-resistive construction, and many people jumped to the conclusion that the theories of fire prevention engineers had been disproved.

Investigation showed, however, that these theories had been proved, not disproved. The building was an excellent example of safety construction—with one fatal exception. There was nothing astonishing in the performance of any of the materials which made up that building—steel, brick, terra cotta, hollow tile, plaster block, bronze, marble, wired glass, window glass and wood. The whole trouble was that these last-mentioned materials, window glass and wood, were used where they should not have been used. On each floor of the Burlington Building facing Clinton Street there were nineteen ordinary glass windows in wooden frames. From the ninth to the sixteenth floors these were all damaged very early by the heat from across the street. About thirty minutes after flames broke through the roof of the building where the fire originated, 200 feet from the Clinton Street side of the Burlington Building, J. C. McDonnell, Chief of the Bureau of Fire Prevention, "noticed that the wooden window frames of the Burlington Building were igniting," and on Clinton Street he "found window glass falling like a hail-storm."

Almost immediately after these windows failed, the combustible contents of every upper floor were burning. In a few minutes the wooden flooring, doors, frames, etc., also were burning.

In expert discussion of this fire (or rather of these simultaneous fires on the upper floors) the opinion has been expressed that light combustible objects were ignited by the radiant heat from across the street even before the window glass cracked. This fire was merely a striking example of the facts that fire frequently makes its entrance to a building through the windows and that window protection must never be neglected where there is the chance of exposure from outside.

In 1903 the Underwriters' Laboratories began to test "fire-windows." Not a single so-



TESTING THE FIRE RESISTANCE OF A ROOFING BY MEANS OF GAS BURNER FLAMES WHICH ARE DRIVEN AGAINST THE SAMPLE BY THE WIND FROM A POWERFUL BLOWER

called fire-window passed. "They failed miserably." Underwriters' Laboratories' tests were considered a joke. The majority of manufacturers of fire-windows thought that no practical window, acceptable to architects, builders and owners, could ever meet Underwriters' Laboratories' requirements.

These requirements have never been made less severe. To-day, nearly one hundred manufacturers are making windows which actually do meet the requirements.

Before describing the tests to which various types of windows listed by the Laboratories have been subjected, it must be made clear that for severe exposures even the most fire-resistive window does not furnish sufficient protection, because a window which allows a great deal of light to come into a room will also allow a considerable amount of heat to pass through its panes. Furthermore, even wired glass softens and falls out when subjected to sufficient heat. Therefore, Underwriters' Laboratories does not label windows for "severe exposure."

"The label [it declares] is evidence of proper construction of the appliance at the factory. Prospective users should first ascertain from the inspection departments having jurisdiction which type, if any, of wired glass windows will be accepted in the location desired, and should make contracts subject to approval by them of the installation, glazing and automatic attachments."

Even where shutters are used, wired-glass windows are usually needed. Shutter protection is either automatic or hand-operated. In the latter case there always exists the possibility of neglecting to close the shutter; in the former some little time must elapse between the beginning of the fire exposure and automatic

operation, and during that time the insufficient protection afforded by a wooden window with ordinary glass may spell disaster.

While the main classification of fire-windows is for "moderate" and for "light" fire exposures, the number of styles and combinations possible is very large, and the number actually manufactured under the Label runs into the thousands.

The testing of a fire-window contains some interesting features. When the many burners have been lighted and the flames begin to roar behind the translucent wired glass, there comes a series of reports, as a network of cracks begins to spread over the window. At this point the qualities of wired glass are apparent to the veriest layman, for the mesh holds the cracked panes tightly in place.

Soon the metal sash acquires a dull color and a strong radiation of heat comes through the glass. This radiation is tested by means of thermo couples placed at various intervals and by strips of cloth hung before the window. During a test, one or more of these may take fire and fall to the floor, thus indicating that inflammable material may be ignited by radiant heat.

As the blue and golden flames play upon the inner surface, the metal sash begins to bend inward toward the heat, until at length there is a pronounced distortion. Finally, after an hour's experience of this kind, the window is rolled back from the flames and played upon by a hose stream, which causes clouds of steam to rise from the heated surface and soon tears gaps in the softened wired-glass panes.

During all this time the engineers have been making careful observations and recording every essential fact.

Doors and Shutters

Under "Roofing" and "Windows" we have been considering protection against fires that attack from the outside, but this is the lesser part of the danger; in the great majority of fires the damage is done by flames that spread from room to room and from floor to floor in the same building. Confine a fire, and you render it comparatively harmless. This is one of the chief objects of fire-resistive construction, which is aided by the knowledge acquired by Underwriters' Laboratories in its tests of materials and devices.

Among these tests, those of doors are of exceptional importance. An inside fire always seeks for openings, and all rooms must have doorways. An open door is an invitation to a fire, as it is to a person, and many doors must be left open much of the time. This is a simple statement of a serious fire problem that has been responsible for thousands of deaths and has given rise to the large industry of fire-door manufacture.

Necessarily, a door is part of a wall or partition, but it is a moving part and therefore must be light enough for easy operation. In the case of a fire, it may be subjected to heat that will ignite ordinary wooden doors and allow the flames to spread on the other side.

The duty of all fire-doors is to resist such an attack, but they are used under such a variety of conditions that a number of forms have been produced for the market. Many styles and makes have been tested and labeled by the Laboratories. These are grouped according to their use as: (1) for openings in fire-walls; (2) for openings in vertical shafts; (3) for openings in corridor and room partitions; (4) for openings to exterior fire-escapes, and (5) for openings in exterior walls. This last class includes window shutters.

Doors for Openings in Fire-Walls

It occasionally happens that the fire-wall in a factory or warehouse obstructs a raging mass of flame which must not be allowed to spread into the adjoining compartment. This exposure sometimes lasts for a considerable time, and the wall's weakest parts, its doors, come in for a searching test.

Three general types for openings in fire-walls are classified according to method of operation by the Underwriters' Laboratories—the rolling type, the sliding and the swinging types, of which the latter two are considered jointly.

Rolling steel doors, as well as all other listed fire-doors, are recognized as standard under the conditions of installation specified in Laboratories' publications.

In this category of doors, those "for openings in fire-walls" are also the "sheet metal fire-doors" and the "tin-clad fire doors with 3-ply wood cores," with many makes and types listed under each heading.

Doors for Openings in Vertical Shafts

Next in importance as safeguards to life are the doors "for openings in vertical shafts." This does not mean that vertical shafts themselves are less important than openings in fire-walls; fire usually spreads much faster vertically than horizontally. But, whereas in the case of a fire-wall there is but one opening to protect, in the case of a vertical shaft there are two, and one door will do for each. In other words, for a fire occurring on the sixth floor of a building to spread to the seventh floor it will have to pass through one shaft door, travel up the shaft and pass through a second shaft door.

The doors in this group belong to the counterbalanced, rolling, sliding and swinging types and include steel, tin-clad, sheet-metal, hollow-metal and metal-clad paneled varieties. Each of these has its peculiar advantages and limitations, which are clearly shown in the reports, and the great mass of information growing out of the Laboratories' thousands of tests is well worth the study of architects, contractors and building owners.

(Continued in the September issue)

Prepared from "A Symbol of Safety," an interpretative study of the Underwriters' Laboratories, Inc., a notable institution organized for service—not profit, published by Doubleday, Page & Company, New York, 1923. XIV + 290 pp. Illustrated.

The Economy and Field of the Horse-drawn Wagon

By Wayne Dinsmore

Secretary, Horse Association of America, Chicago, Ill.

COMPETITION in the contracting field is keen. There is not much chance to raise prices on particular jobs, therefore to maintain a fair margin of profit, contractors must pay special heed to hauling costs. Hauling is not a hit-or-miss proposition. It is one of the most important factors in any business that requires delivery of commodities or moving of working equipment. It may either make money or eat up the profits. For this reason some of the most successful contracting companies are using horses and mules for all short hauls and for the majority of their grading, fill, excavating and paving operations. These firms have made a careful study of the different kinds of hauling equipment, and their books show that both trucks and animal power have

a contractor's work takes him; horses and mules may be readily acquired. This is because they are produced on farms and are reared as an incident to farming operations, broken and usually sold from five to seven years old. The supply depends entirely on demand. It is not controlled by any company or combination of companies. Money invested in harness, wagons, plows and scrapers represents only a small part of the contractor's investment. When business is slack, these may be stored and the teams sold.

Under conditions similar to those which prevail in New York City, where the expense of maintaining horse equipment is much higher than the average, the cost of operating a team will not exceed \$4 a day, exclusive of driver.



ELEVATING GRADER HAULED AND PUSHED BY HORSES LOADING HORSE-DRAWN WAGONS ON LARGE GRADING JOB

a place, but that within its working zone there is no power that is as efficient or as economical as the horse-drawn unit.

Horses and mules have the advantage of being available at any place and at any time. It is easy to increase the working force without loss or heavy investment. Horses and mules are necessary for working over soft ground and in other places where motors cannot be used to an advantage. Depreciation is low on horses and mules and they may be readily sold when the contractor is through with them and the money invested in interest-bearing securities until such time as the contractor's work again expands.

It makes little difference into what section

In New York City a good team of horses can be bought for \$400, a dump-wagon for \$300, and a very good harness, complete with collars and bridles, for \$85. Blankets, halters and other paraphernalia may amount to \$15 or more, but the total cost of outfitting one complete unit would not exceed \$800. These figures are for a dump-wagon which would carry up to 5- or 6-ton loads.

You can figure on a team's covering 20 miles a day without loss of condition. In contractors' work they haul an empty wagon one way and have a brief rest while it is being loaded and unloaded. The number of loads will depend entirely on the distance to be covered. Recently, two teams belonging to I. K. Hesslink of

Sheboygan, Wis., hauled all the steel used in the construction of a 4-story building—403 tons—in 8 days, making an average of more than 25 tons a day for each pair. The hauling distance from the docks to the building was approximately one mile.

Another advantage of using teams is that depreciation is low; in fact, many contractors make a profit on the sale of their surplus work stock by buying good, thin animals in the spring, working them all season, and selling them fatter, bigger and in better condition in the fall, at a higher price than they paid for them.

The Horse Association of America has gathered comprehensive data from every field in which horses and mules are employed. It has gone directly to individuals and firms using horses and motors and has secured statements of actual costs and working efficiency of the two types of power. Nothing can more forcibly show the necessity for horses and mules in the contracting business than the following statements which have been furnished by the contracting firms themselves:

C. W. Blakeslee & Sons, New Haven, Conn.—“The immensely cheaper cost of horse equipment, slower depreciation, and smaller operating costs put the motor truck in a luxury class, except for long-distance hauling where the roads and other conditions are favorable. The almost prohibitive cost of really good 5-ton motor trucks, with the certainty of heavy tire, gas and repair expense, is sufficient reason for our using but three motor trucks of our own, as compared with our 200 horses. For any extra or special work we can hire as many motor trucks as we need at a lower rate than we can afford to own and operate them. Motor trucks on long-haul work can only be used with profit when there is little delay in loading

or unloading them.

“There are a good many conditions under which we can operate horse-drawn vehicles where a motor vehicle is not able to make any headway: for instance, in making fills across a deep ravine or any place of that kind, we can send teams out on the dump where a truck would frequently sink to the hubs.”

James Stanton & Son, Leavenworth, Kans.—“We are using 400 horses and mules in general contracting, road building and excavating. We find so much work where only horses and mules can be used, such as grading, hauling over soft ground, etc., besides the lower initial investment and operating costs, that we know horses and mules are indispensable.”

Maney Bros. & Co., Oklahoma City, Okla.—“We find horses and mules indispensable in both low cost and efficient service in contracting, railroad construction and irrigation work. We use 480 horses and mules.”

W. J. Sheppard, Chicago, Ill.—“I prefer horses or mules for contracting work, because they furnish the most reliable and most economical service. One of the contracts which I was recently engaged on was the job of moving approximately 30,000 cubic yards of dirt where we were grading down the hill just north of 87th Street on Western Boulevard and hauling the dirt over to fill in lower areas farther north on the same boulevard. The hauls were from $\frac{1}{4}$ - to $\frac{1}{2}$ -mile. We used a large elevating grader operating with twelve horses—eight in front and four behind. At times, on account of unusually stiff grading, we put on an extra four in front, making sixteen in all. I have moved as much as 122 cubic yards an hour with this outfit, and consider it the most economical means ever devised for moving large bodies of dirt, where conditions will permit its operation.

Different View-Points

OUR Society Editor in search of copy for his column called on the daughter of an East Texas road contractor for a poem on Spring, and received this “reward”:

“Sweet verdant Spring is here at last, in pleasing panoply;
And early birds, of sweetest voice, pipe tuneful melody.”

As the editor was leaving the house the contractor arrived and as a joke he was likewise asked to express in rhyme his opinion of Spring. It so happened that he had just worn out his fourth pair of hip-boots in trying to locate a road job he had bid on. He wrote:

“The cement shack has sprung a leak,
The grade looks like a bay.
The estimate is very weak,
And Saturday we must pay.

“Twelve cars of rock are on the switch,
Eight more are due to-morrow.
Two motor trucks are in the ditch,
My life is full of sorrow.

“The mules have bogged down belly-deep,
The frogs croak all the day.
The overhead would make you weep,
Oh, Spring, please go away.

—Texaco Tips.

Resurfacing a Street Carrying Double Car Tracks

WHEN the double street car tracks in Bettendorf, Iowa, were relaid several years ago, they were put down at a grade which would permit resurfacing with brick, inasmuch as the pavement had been in bad condition for the last ten years. The street is a part of the main artery out of Bettendorf, leading northward along the west bank of the Mississippi River. It is about 50 feet wide.

The City Engineer, N. H. Tunnicliff, specified a 3-inch vertical fiber plain wire-cut brick, asphalt-filled by the squeegee method. The bricks were laid on a 1:4 cement sand bed, 1-inch in depth, after new concrete had been used to fill all the major depressions and holes in the old concrete pavement. The contract was let at \$2.42 per square yard plus \$10 per cubic yard for extra material used in filling cracks and holes.

Informal Bids

Watch the Items and See That You Have Filled in the Bid Blank Correctly

AT some lettings during the current season there has been evidence of carelessness in the filling out of the proposal forms, such as overlooking an item and leaving it blank or failing to sign the proposal.

While at first thought it might be said that a bidder should be given an opportunity to correct or supply a minor omission, a careful consideration of the consequences that would result from such a policy leads one to the conclusion that a strict policy of throwing out all bids that are incomplete or informal in any respect is on the whole more fair and less likely to cause friction and dispute among contractors over the letting of the job. It is difficult to draw the line between a minor omission and a material one, and anything short of a strict policy of excluding informal bids is certain to lead to confusion and abuses.

While the filling out of a bid blank requires a certain amount of care, it is by no means a

difficult task. It is, in fact, simple clerical work that involves the copying onto the official form of figures already decided upon and presumably entered upon other memoranda. The difficulty is rather to understand why there should be any omissions when the information concerning the items involved is shown on the official detail sheets and making out the proposal form comes down simply to taking the items one by one in the order in which they appear and entering a price against them.

Don't leave the making out of your bid form until the last minute and then rush through it hit or miss, with the assumption that if you skip an item you will be given a chance to fix the bid up. Looseness in a matter of this sort, resulting in informality of the bid, indicates either a natural carelessness or that it is a half-baked bid that has been made out hastily and without due consideration.

—The Nerba.

A Bridge of Unusual Design

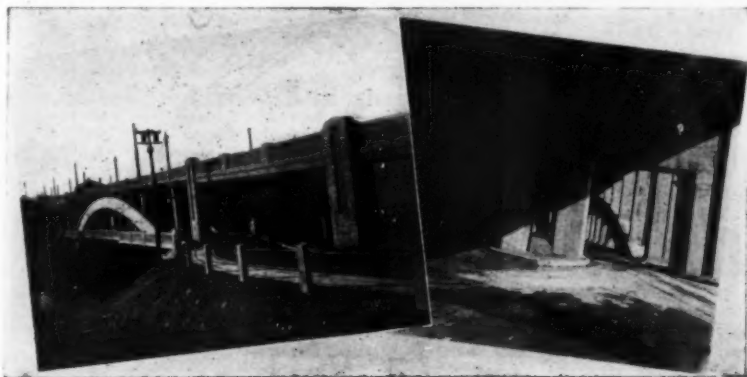
Double-Deck Construction Makes It Possible to Carry Light and Heavy Traffic of Two Streets Over River in Watertown, N. Y.

IN the design of the concrete highway bridge at Watertown, N. Y., a clever use was made of the adaptability of concrete by making the bridge of double-deck construction. The upper deck carried the heavy traffic of Court and Coffeen Streets over the Black River and also across the railroad which parallels the river. The lower deck carries lighter traffic of River and Newell Streets, which are parallel to the river and north of the railroad.

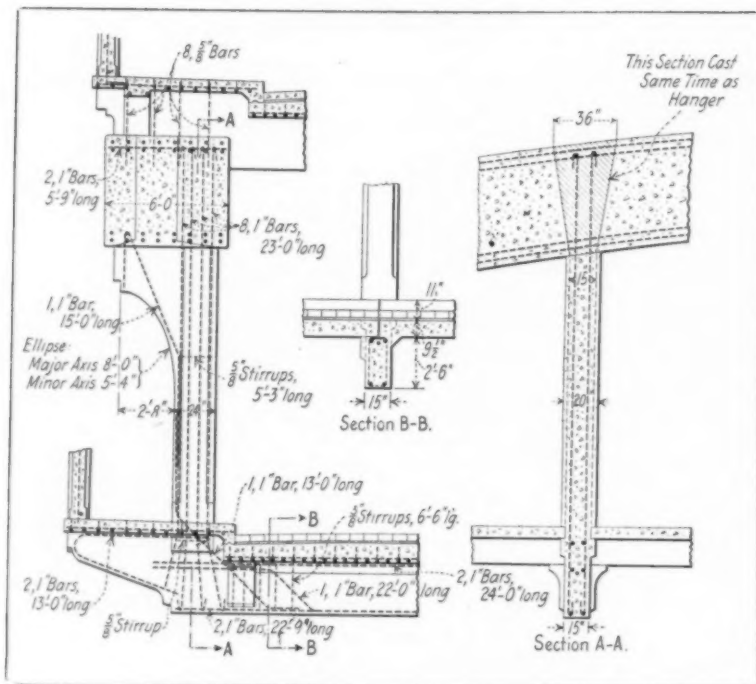
The bridge is carried over the river on four reinforced arch ribs, the upper deck being sup-

ported by open spandrel construction, and the lower deck being hung from the arch rib. The arch ribs are 6 feet wide and 5 feet deep, so spaced as to give two 12-foot roadways and two 4-foot sidewalks on the lower deck. The river span is 195 feet, and the height of the arch rib above the springing line 38 feet. The lower deck is 22 feet below the upper deck. The span across the railroad is 86 feet.

To avoid cracks in the hangers supporting the lower roadway, due to the difference in the moduli of elasticity of the steel reinforcing



TWO VIEWS OF CONCRETE HIGHWAY BRIDGE AT WATERTOWN, N. Y.



DETAILS OF THE DOUBLE-DECK BRIDGE AT WATERTOWN, N. Y.

and the concrete, an ingenious method was employed. When the arch ribs were poured, wedge-shaped openings were left at the points where the steel rods were hung to support the lower deck. After the lower deck was placed, the supports were removed, permitting these rods to be stressed with the entire dead load of the lower deck, thus taking the full deformation due to this dead load. Forms were then built around these hanger rods, and the concrete was poured, embedding them. Thus the only additional elongation of the steel which

may be expected will come from live loads which will not be sufficient to cause any appreciable cracking in the concrete.

The Concrete Steel Engineering Company of New York City were the designing and supervising engineers. The bridge was built by the Peckham Construction Company of Buffalo, and Atlas portland cement was used in its construction.

ACKNOWLEDGMENT.—Illustrations by courtesy of *Contractors' Atlas*.

Tar Macadam Pavements in Cambridge, Mass.

ABOUT 40 per cent of all the pavements in Cambridge, Mass., are of the general type called "tar macadam"—using about 1½ gallons per square yard supplied in two coats, according to Lewis M. Hastings, City Engineer, Cambridge, Mass., in the *Journal of the Boston Society of Civil Engineers*.

For new construction using new cracked stone 4 to 6 inches thick, the average cost of this type of paving is about \$1.50 per square yard. Applied to an old macadam street with 3½ to 4 inches of new stone rolled into the old stone, the cost is about \$1 per square yard. Applied to residential and light business streets

and given a yearly coat of Tarvia B or similar bituminous compound and sand, this type of pavement gives promise of long life.

Probably Harvard Street, from Prospect Street to Massachusetts Avenue at Quincy Square, is as good an example of this type of pavement as there is in Cambridge. The traffic is a mixture of business and pleasure cars, sometimes heavy and sometimes at night very swift. Most of this pavement was built in 1908, or about 15 years ago, and has never received anything but the surface treatment described above, at a cost of about one cent per square yard annually.



The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

A FIVE-JOB WOODWORKER

The latest illustrated price list of the Crescent Machine Co., Leetonia, Ohio, describes the new model Crescent universal wood worker which has a hand-saw, a jointer, a saw table, a borer and a reversible spindle shaper, any two or all of which may be used at the same time.

NEW AIR COMPRESSOR UNITS

Bulletin 153, recently issued by the Novo Engine Co., Lansing, Mich., describes the new Type H Novo air compressor outfit, in which the engine and compressor have individual cooling systems and the engine can, if necessary, be used as an independent power-plant.

HOW TO CURE NEW MIXED CONCRETE

A new book, "How to Cure Concrete," has recently been prepared by the engineers of the Dow Chemical Co., 361 Jefferson St., Midland, Mich., describing in detail the use of Dowflakes, a specially prepared calcium chloride which speeds up the curing of concrete.

THOROUGHLY MIXED CONCRETE

The Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, will be pleased to furnish contractors with its catalog describing the 18 models of Jaeger mixers, which tilt and pour and which are claimed to have larger capacities at equal speed and greater thoroughness in mixing.

STEEL DUMP BODIES

The latest literature and price list of the Heil Co., 1243 26th Ave., Milwaukee, Wis., describes Heil 3-batch bodies having high ground clearance, as well as the Heil hydro-hoist, both of which are mountable on trucks of any make or model.

SEMI-PNEUMATIC TIRE TIES

The B. F. Goodrich Rubber Co., Akron, Ohio, will be pleased to furnish information regarding the Goodrich semi-pneumatic tire, which is a truck tire with solid rubber where you need it and maximum air space where you must have it.

LANTERNS FOR PROTECTION

Watchmen's lanterns and warning lanterns for contracting operations are described in detail in a 40-page illustrated catalog issued by the Defiance Lantern & Stamping Co., Rochester, N. Y.

WHAT DOES STONE-SPREADING COST YOU?

If you are interested in a machine which will lay gravel, slag or stone evenly at a required depth and width from the end of a truck, thus eliminating the uneven distribution of stone by hand from piles dumped along the subgrade, get the literature of the Burch Plow Works Co., Dept. B-7, Crestline, Ohio, describing the Burch stone spreader.

FOUR-CYLINDER INDUSTRIAL MOTORS

The Waukesha Motor Co., Waukesha, Wis., has just issued a new 32-page booklet describing the Waukesha industrial unit in detail and illustrating its application in stone-crushing and screening plants, air compressors, mixers, motor trucks, cranes, trench excavating machinery and pumping units.

A TRUCK-MOUNTED INDUSTRIAL CRANE

The Byers Machine Co., 300 Sycamore St., Ravenna, Ohio, has just issued a new 16-page booklet, Form 1042, which describes in detail the Byers Truck-rane, which is a small, well-built industrial crane constructed according to highest standards and designed to be mounted on motor truck chassis.

A BIGGER PAVER FOR BIGGER JOBS

The Koehring Co., Milwaukee, Wis., has just issued a complete description of its new 32-E paver designed and built for the bigger jobs. A complete batch of 56 cubic feet of aggregate is handled from one truck or batch box, and it will lay 4 feet of 18-foot road 7 inches thick from one batch.

A WELL-DESIGNED MOTOR TRUCK

The Kissel Motor Car Co., Hartford, Wis., has recently issued a book giving brief specifications of all Kissel truck models in four capacity sizes which completely cover the needs of contractors. This book, or the complete Kissel truck catalog which gives more minute descriptions of Kissel transportation units, may be secured without charge from the Kissel Motor Car Co.

A NEW MOTOR ROAD ROLLER

The Huber Mfg. Co., Marion, Ohio, will be pleased to send its new 16-page illustrated booklet to any contractors interested in a motor road roller with special features making it smokeless, always easy to start and ready to go.

WATER-SUPPLY FOR SWIMMING POOLS

Bulletin No. 500 issued by the Graver Corp., East Chicago, Ind., contains a wealth of information on the water requirements for swimming pools, with data on swimming pool design, construction and operation, of particular interest to contractors as well as to those intending to build new pools.

A SIMPLIFIED STONE CRUSHER

The Iowa Mfg. Co., Cedar Rapids, Iowa, has just issued an illustrated booklet describing in detail its new simplified crusher adaptable to all types of crushing work, with adjustable jaws which may be set while the machine is running.

WHEELBARROWS FOR ALL JOBS

The Puffer-Hubbard Mfg. Co., Minneapolis, Minn., will be pleased to furnish particulars and prices on wheelbarrows for all kinds of contracting jobs, where proper price and prompt delivery mean much to the contractor.

AN AIR-OPERATED SCRAPER HOIST

The new Model 300 Turbo Waughhoist, excellent for operating scraper units, is described in detail in an 8-page booklet issued by the Denver Rock Drill Mfg. Co., Denver, Colo.

SIXTY-FOUR PAGES ON TRACTORS

The C. L. Best Tractor Co., San Leandro, Calif., has prepared a very interesting illustrated booklet on the various uses and service of Best "Thirty" and "Sixty" tractors.

PORTABLE BUILDINGS

The latest catalog of the Kolb Building Co., Inc., 30 Church St., New York City, describes in detail Kolb portable fabricated buildings for contractors' field offices, schools, voting booths, boat-houses, club houses, skating pavilions, etc.

A NEW CLOSE-COUPLED CENTRIFUGAL PUMP

The Pennsylvania Pump & Compressor Co., Easton, Pa., has just issued a bulletin describing its new close-coupled, self-contained, low-head, gasoline-engine-driven centrifugal pumping unit, which has many advantages for contracting service.

TOOL AND SURFACE HEATERS

Chausse oil-burning tool and surface heaters for repairing asphalt pavements without the usual smoke and with an unusual saving in time are described in detail in the latest bulletin of the Chausse Oil Burner Co., 26 Lincoln Bldg., Detroit, Mich.

HIGH SPOTS OF MOTOR TRUCKS

The International Motor Co., 25 Broadway, New York City, has issued a booklet entitled "Exclusive Features," which outlines 27 high spots in the construction of the Mack truck, a dependable transportation unit for contractors.

TRAFFIC TESTS OF CONCRETE ROADS

A very interesting illustrated booklet entitled "The Story of the Traffic Tests on the Bates Experimental Road as told by the Camera" has been published by the Portland Cement Assoc., 111 W. Washington St., Chicago, Ill., and may be secured free by any contractors or engineers interested in concrete road construction.

A NEW CONCRETE SURFACER

The Haskins Type H-6 equipment, consisting of cup wheel, flexible shaft and motor mounted on a movable platform for surfacing concrete floors is described in detail in the bulletin of the R. G. Haskins Co., 520 W. Monroe St., Chicago, Ill.

REINFORCED CONCRETE PILING

Supplement No. 15, issued by the Massey Concrete Products Corp., Peoples Gas Bldg., Chicago, Ill., describes in detail the manufacture of Massey octagonal and Hollowspan piles as well as the methods used in driving concrete piling.

A COMPLETE ROAD MAINTAINER

The Gray Giant combination road-street maintainer, a 50-horse-power tractor, equipped with scarifier, grader and roller, is described in detail in the literature of the Gray Tractor Co., Inc., Minneapolis, Minn.

GLAZED CLAY METER-BOXES AND COVERS

In its latest catalog the W. S. Dickey Clay Mfg. Co., 203 New York Life Bldg., Kansas City, Mo., describes in detail and tells the advantages of its glazed clay meter-boxes and improved light-weight metal meter-box covers, both of which are used in many cities.

HELP IN DESIGNING FLOOR CONSTRUCTION

The new Truscon steel joist data book issued by the Truscon Steel Co., Youngstown, Ohio, contains a wealth of information which should be helpful to contractors and engineers in the design and construction of buildings having light occupancy loads. It also contains details and tables of engineering data of value.

AIR-BRUSH PAINTING EQUIPMENT

The latest literature of the Dayton Air Brush Co., 17 Maryland Ave., Dayton, Ohio, describes in detail the universal application of the Dayton air brush for spraying and flowing all kinds of paints, enamels, varnish, shellac, and calcimine in the various fields of contracting work.

REPAIR PAVEMENTS WITH COLD PATCH

A new 24-page, pocket-size, illustrated booklet has been issued by the Asphalt Sales Dept., the Texas Co., 17 Battery Pl., New York City, describing and illustrating the Texaco cold patch method of repairing all types of roads and streets.

CONCRETE SEWER AND DRAIN TILE MOLDS

The Raber & Lang Mfg. Co., Kendallville, Ind., has issued a new 32-page catalog, No. 11, giving complete information regarding Crescent bell-end sewer pipe molds with contractible cores. In Bulletin 33 it describes metal forms for making concrete highway and railroad culverts.

A PORTABLE CENTRIFUGAL FOR FORDS

Contractors will be interested in the new Barton portable pump made by the Barton Products Co., Jackson, Mich., which can be attached to the front of a Ford Machine and which is able to handle emergency pumping operations, including the dewatering of excavations and furnishing water at the rate of 250 gallons a minute for road work or fire protection.

UNDERGROUND WATER-SUPPLIES

A 64-page bulletin covering completely the subject of underground water-supplies has recently been issued by Layne & Bowler Co., Memphis, Tenn., and may be secured by any contractors, engineers or municipal officials interested in guaranteed water-supplies and turbine pumps.

TRACTORS FOR EMERGENCY WORK

The reason why the Holt Caterpillar tractor is equal to day-in-and-day-out service and also able to handle emergency jobs is told for the benefit of interested contractors in the most recent literature of the Holt Mfg. Co., Inc., Peoria, Ill.

TRUCKS THAT LAST LONGER

Federal trucks last longer and operate for less money according to Book 8-23, "Making One Thing Better," which may be secured by any contractor interested in economical motor-truck hauling, by writing to the Federal Motor Truck Co., Detroit, Mich.

A NEW ASPHALT MIXING PLANT

The new Iroquois 3-unit portable asphalt mixing plant made by the Iroquois Sales Dept., the Barber Asphalt Co., Land Title Bldg., Philadelphia, Pa., is made in two capacities, of 800 and 1,850 square yards respectively, and is described in detail in literature which may be secured free on request.

TRUSTWORTHY GASOLINE ENGINES

How the Climax engine puts pep in a shoveler or bucket, together with information regarding the machines using Climax engines as standard power equipment, will be found in the catalog of the Climax Engineering Co., 11 W. 18th St., Clinton, Iowa.

TRENCH EXCAVATORS

Why one contractor owns seven Buckeye traction ditchers and other contractors write so favorably concerning them is found in the illustrated literature of the Buckeye Traction Ditcher Co., Findlay, Ohio.

REPEAT ORDERS PROVE TRUCKS' VALUE

The General Motors Truck Co., Pontiac, Mich., will be pleased to furnish contractors with information regarding the GMC truck, which has received so many repeat orders from contractors because of its strength, stamina, and dependability.

MAKING PERFECT DITCHES

The story of how the Adams adjustable leaning wheel grader makes perfect ditches with a back-sloper attachment, is told in detail in the latest catalog issued by J. D. Adams & Co., Indianapolis, Ind.

STEEL TOWERS FOR CHUTING CONCRETE

The superiority of Ransome steel chuting plants for placing concrete is told in detail in interesting literature which may be secured from the Ransome Concrete Machinery Co., 1750 Second St., Dunellen, N. J.

A CONVENIENT SIZE EXPANSION JOINT

Ideal expansion joint, which is shipped in crates or boxes weighing about 325 pounds and which provides for expansion in improved pavements, is described in full in the literature of the Waring-Underwood Co., Commercial Trust Bldg., Philadelphia, Pa.

A 20-FOOT PORTABLE CONVEYOR

The Robins 20-foot portable conveyor with a troughed belt and no side boards, which has an operating efficiency that will reduce your loading costs to a minimum, is described in illustrated Bulletin No. 57, which may be secured from the Robins Conveying Belt Co., New York City.

PAIS FOR CONTRACTING OPERATIONS

Iron Horse Metalware Catalog No. 921 describes the three styles of contractors' pails as well as cans for oily waste, rubbish and storage, and may be secured from the Rochester Can Co., Rochester, N. Y.

SMALLER UNLOADING COSTS

The literature of the Universal Road Machinery Co., Kingston, N. Y., describing the Reliance portable car unloader for handling crushed stone, sand or gravel, gives contractors some interesting information as to how they can lower the cost of unloading railroad cars.

TROUBLELESS WATER-METERS

Catalog A-52 issued by the Union Water Meter Co., Worcester, Mass., shows how cities equipped with King meters have eliminated the trials of poor meters.

SAVE THE ROAD EDGE

The advantage of International steel paving guards, which have superseded concrete curbs for protecting the edges of concrete, brick, wood block and other pavements, is told in detail in the illustrated literature of the International Steel Tie Co., Cleveland, Ohio.

QUICK-LOADING CAR CHUTES

The Dow quick-loading car chute, which easily attaches to the side of cars and loads trucks in a remarkably short time, is described in detail in an illustrated folder, Bulletin C, which the Dow Co., Inc., Louisville, Ky., has recently issued for contractors.

VALVES AND HYDRANTS

Catalog F of the Rensselaer Valve Co., Troy, N. Y., tells the complete story of the construction and wearing qualities of Rensselaer valves, gates and hydrants.

Equipment for Highway and Building Contractors



A GRAHAM BROTHERS ROAD BUILDER TRUCK OWNED BY ROBERT G. LASSITER & COMPANY, ON A ROAD JOB AT SUMTER, S. C.

This company has seven of these trucks working, two of which have seen very hard service and are now on their fourth project



KOEHRING CONSTRUCTION MIXER OWNED BY EVATT CONSTRUCTION CO., BOSTON, MASS.

The mixer shown was working on the Congress Street Building, a 10-story reinforced concrete office building, throughout the fall of 1922 and during the winter. This company has a number of these mixers working on the new \$3,500,000 Chamber of Commerce Building in Boston, this being the largest office building contract ever having been let in Boston, according to Clyde E. Dodge, New England Manager, The Koehring Company, Milwaukee, Wis.

Is Labor Shortage an Unmixed Evil?

Charles Piez, President, Link Belt Company, Says, "Give the Remedies Time to Effect a Cure"

A REVIEW of the business chart of the Link-Belt Company shows a pronounced upward trend with very few serious peaks or depressions from 1908 to the beginning of 1914, a decided drop at the middle of 1914, followed by a rapid rise beginning in 1915 and culminating in 1918; then a short recession after the armistice, followed by a spectacular rebound which culminated in the phenomenal peak of 1920. After that came the collapse of 1921, when prices dropped 30 per cent and volume 50 per cent. Then came the slow recovery of 1922, followed by the present wave of prosperity.

A mere glance at the chart leads to the reflection that if a part of the demand in 1920 could have been postponed for six or nine months, and a part of the demand of the past six months could have been quickened by a similar period, a fine business curve would have resulted, and a general business disaster and wide-spread unemployment would have been avoided.

I can understand the vagaries of business during the war, for then the natural laws of trade were subordinated to the war emergency. But why did everyone, in the face of rapidly rising prices, want to buy lavishly in 1920?

I can appreciate why buying stopped in 1921, but can anyone explain why, after the wholesale reduction in prices resulting from the recession of 1921, there should again be such a concentration of demand as to advance both wages and prices to almost the levels that brought disaster in 1920.

Our producing capacity would have proved amply sufficient to have taken care of all of the business of the past four years without overtime, if it had come in with a fair degree of uniformity. But the buying microbe, like the influenza germ, seems to attack all simultaneously, and in consequence, we have hectic booms, with prices exorbitantly high in 1920, and nerve-racking depressions with prices too low in 1921.

As a remedy, the manufacturer asks for a removal of the restrictions on immigration to reduce labor costs, and the consumer asks the Government to prosecute the profiteer, and enforce general price reductions through federal control of industry. Neither remedy will effect a cure; in fact, the application of either will but aggravate the difficulty. American business must be stabilized so that a fairly uniform demand can be met by regular employment of both the workers and the facilities in industry.

"Feed a cold and starve a fever" is a house-

hold adage, and the latter half suggests a mighty good remedy for what ailed business in 1920, and what is ailing it, though in a much milder form, to-day. There would be no labor shortage, no towering prices, no serious and continued unemployment, if some of the demand at the peak were postponed to swell the volume during the recession that is bound to follow.

Bringing in foreign labor, to meet the peak demand, will but swell the list of the unemployed during the depression that inevitably succeeds the boom. Forcing down prices through Government action will but increase the demand when the buying fever is upon us, and will but prolong the period of recovery.

The health of the state is of greater importance than excessive prosperity of business, and, to provide for that, we need a more homogeneous citizenship. That can't be attained by removing restrictions on immigration, but it can be improved by a wiser selection. I doubt very much whether Congress will permit a material increase in number of immigrants in the near future, and business must, therefore, learn to cut its coat to suit its cloth. It must find a way of regularizing the demand, so that industry running normally can supply it.

Business had a severe lesson in 1920, and still remembers vividly the "cold gray dawn of the morning after." It is proceeding cautiously, for it has no desire to encourage a runaway market; and the banks are assisting by advising postponement of construction and large purchase, whenever advancing prices show danger. The banks themselves were responsible for much of the inflation in 1920, and they too, have learned that a uniform business, on a moderate scale, is both safer and sounder for all, than one that fluctuates from freezing to boiling.

We can't do all the business of three years in a single year, and demand postponed doesn't mean that it will never reappear. We need business for 1924 and 1925. Then why bid for labor that doesn't exist? Why increase the fever of buying by foolish promises of delivery or unnecessarily tempting terms of credit?

Impatience is an expensive trait, and when a man is willing to pay an exorbitant price for prompt delivery of a luxury rather than wait a few months and save 25 per cent, he is in a dangerous way and needs attention. And when that state becomes general among all of our people, then a labor shortage and exorbitant prices are the only remedies. So let us stop whining and give the remedies time to effect a cure. —Management Engineering.

Where to Purchase? Pages 3 to 45 solve the question.

Precast Concrete Piles and How They Are Driven

The Economy and Adaptability of Precast Piling for Trestles, Bridge Footings and Other Permanent Structures

OF the many possible types of foundations precast concrete piles offer one of the surest and most nearly fool-proof, which accounts largely for the frequent adoption of this form of construction for such work as railroad trestles, bridge footings and other structures where permanence, high bearing power and exceptional safety are among the requisites.

There is perhaps no other precast concrete unit which requires greater care in the manufacture than a concrete pile. Not only is it subject to handling-stresses, but it must also resist the impact of the driving hammer as well. When reasonable care is taken, however, and a uniformly high-strength concrete secured, the question of handling precast concrete piles is not a difficult one. The octagonal pile made by the Massey Concrete Products Corporation, Peoples Gas Building, Chicago, Ill., is cast horizontally on wooden pallets the width of one face. Two steel side forms, each supporting three side faces, are clamped to the pallet, the top face being left open for filling and troweling the concrete. The reinforcement consists of eight longitudinal bars securely fastened to welded steel hoops. In the case of longer piles, additional shorter bars are provided in the center section.

Manufacturing Piles by the Centrifugal Process

The latest development in concrete piling manufacture is the use of the centrifugal process which this same company has used so suc-



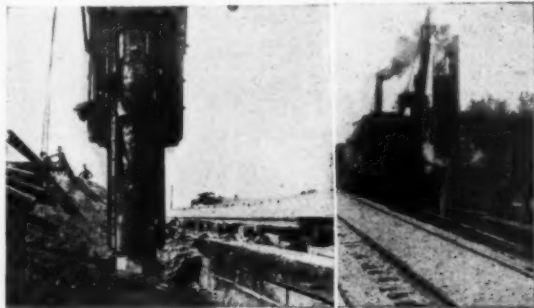
HEXAGONAL CONCRETE PILES STACKED IN YARD FOR CURING

cessfully for the production of concrete poles in longer lengths in recent years. The fact that such piles are hollow gives the added advantage that where jetting must be resorted to, the hollow center forms a jet pipe, requiring only a connection at the top. The central location of the jet opening in the pile tip produces a uniform backwash on all sides and insures straight driving. These Hollowspun piles, as they are called, have been driven both by the jetting process and with a driving hammer.

The experiments have been so successful that there seems no doubt that this form of construction will take its place among the recognized foundation standards.

Driving Concrete Piles

There are two principal methods in use for driving concrete piles. The first consists of jetting the piles in place, sometimes giving them a final setting with a hammer. In recent work a pressure of 150 pounds per square inch applied through a 2-inch tube pointed at the end to 1 inch has proved to be a satisfactory arrangement for the solid cast piles. The same water pressure can be used for the Hollowspun piles, whose point, of course, forms a jet of its own. Jetting is particularly useful in sandy soil where hammer driving is difficult and at the same time considerable penetration must be secured. Frequently it is found that, on account of possible future dredging or scour, it is necessary to carry the piles



TWO VIEWS ILLUSTRATING GOOD PRACTISE IN DRIVING CONCRETE PILES



COMPLETED SECTION OF A CONCRETE PILE TRESTLE

to a greater depth than is absolutely required for the bearing power at the time of driving. The water jet in this case is often the most economical method of driving the piles.

The second method of driving is with a hammer, either a drop or a steam hammer. More elaborate arrangements are necessary when the pile is to be driven with a hammer. In the first place, the drop hammer has a much greater shattering effect in proportion to its driving effect than a steam hammer. For this reason a steam hammer is to be recommended. It should be provided with a standard hood and follower. Laminated wood blocks or special driving head with a cushion of sand, rope or other material should be placed between the driving block and the head of the pile.

It is essential that concrete piles be driven to the exact position shown on the plan. On sloping banks and at other points, if necessary, a hole 3 to 5 feet deep may be dug with a post-hole digger at the location of each pile to aid in holding it in the proper position. On

more level ground a timber frame with spaces through which the piles may be driven is sometimes used.

Before driving is started, the pile should be carefully plumbed and the driver leads held in the proper position by guys. The top of the pile may also be struttled to hold it in position. It is sometimes found desirable to station one man on the center line of the bent that is being driven, in the case of railroad trestles, and another on a line parallel with the center line of the track and opposite the pile that is being driven, so that by proper signals the foreman can be warned of any tendency of

the pile to go out of line. If the pile gets slightly out of line in driving, the ground may be dug away from one side to as great depth as practicable and pile pulled or jacked into place.

The driving of concrete piles should be light until the pile has reached somewhat hard bearing, after which the intensity of the driving may be increased. Every effort should be made to drive the piles to the cut-off shown on the plans. If the plan cut-off is reached before a satisfactory bearing is obtained, the pile may be allowed to stand for a day before driving is resumed. In this way, resistance to driving is frequently increased so that the necessary bearing power can be developed.

Where it is not possible to drive piles to the plan cut-off, it is necessary to remove the portion above that point. It is customary to remove all concrete down to the cut-off level, but to leave a few feet of the reinforcement projecting above, which is then bent down to a horizontal position to form a bond with the cap.

A New Close-coupled Centrifugal Pumping Unit

This Low-Head Gasoline-Engine-driven Unit Has Many Features of Interest to Contractors

TO meet an increasing demand for a compact, self-contained, low-head centrifugal pumping unit at a moderate price, the Pennsylvania Pump & Compressor Company, Easton, Pa., has developed a close-coupled portable unit in which the pump impeller shaft is integral with the engine crank-shaft. This makes it possible to build a unit of short overall length with a considerable reduction in weight, thus increasing the portability of this machine when mounted on light-weight trucks.

This design has eliminated several parts, including the customary coupling between the pump and engine, and thus secured a higher

mechanical efficiency. The pump has a 3-inch discharge and a 4-inch suction and is capable of handling from 60 gallons per minute against a 38-foot head to 360 gallons per minute against a 15-foot head.

The pump itself contains only eight parts—the casing, head, impeller, base, shaft-nut, shaft-sleeve, water seal cage and gland. The outfit is equipped with an air-cooled New Way engine which eliminates all the unnecessary parts of the water-cooled engine. The cooling method in this engine accomplishes directly what others do indirectly. In every water-cooled engine the cylinder is first cooled by water, which

in turn is passed over a screen cooler to be cooled by air. By the New Way method the heat is taken away from the cylinder walls by a strong blast of air from the fly-wheel, which throws thousands of feet of air around the cylinder every minute, thus keeping the cylinder at the proper temperature to produce the maximum power with the least fuel.

This portable pumping outfit is particularly adaptable for pole treating, dewatering excavations, for general contracting service, for irrigation, for pumping conduits and for general portable pump work.



A SELF-CONTAINED PORTABLE CENTRIFUGAL PUMPING UNIT

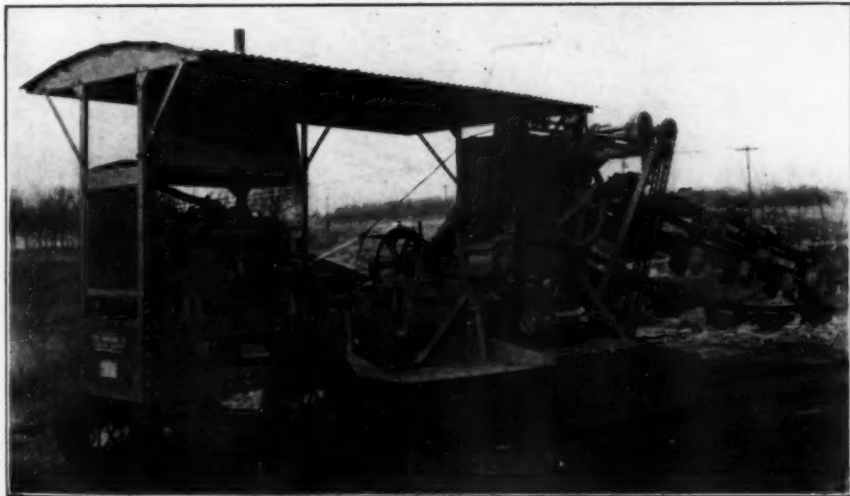
A Newly Designed Trench Excavator

12-Foot Wheel-Base Permits Maneuvering the Machine in Confined Areas

THE new Model 30 trench excavator manufactured by the Parsons Company, Newton, Iowa, is built to a brand-new design in which are incorporated some rather unusual features. It is an attempt on the part of the manufacturer to follow the most modern standard practice in machinery construction. It is claimed that the practical operation of this model in active work has shown its unqualified success as a compact machine having a greater

range for its size than any other machine so far built.

One of the outstanding features of the design is the unit construction of the main machinery assembly, which is designed along the lines of standard practise in automobile construction, making a very compact unit but at the same time a very accessible one. The endless-chain crowding device, or, as it is sometimes termed, the boom suspension, permits the



A COMPACT EXCAVATOR OF NEW DESIGN

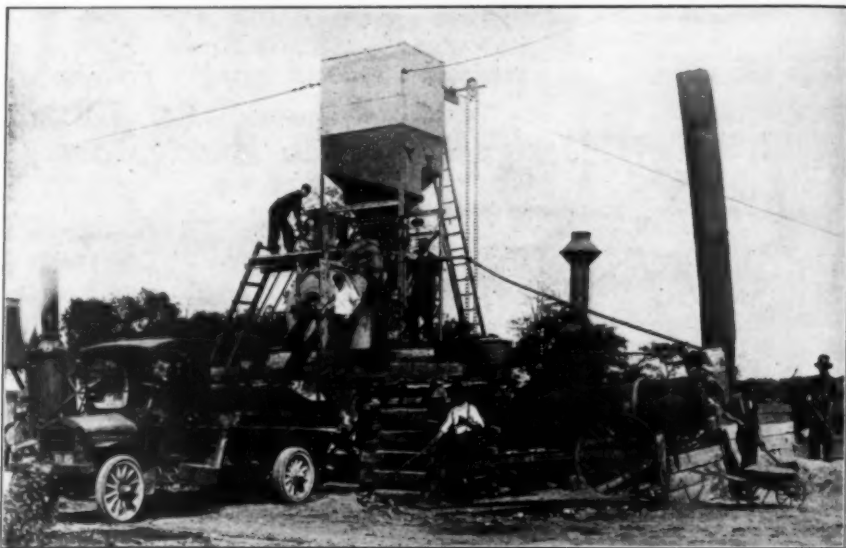
digging buckets to be held at the exact grade at all times and under all conditions. The compactness of this model gives it additional strength. The machine itself is 7 feet 10 inches wide and 9 feet 9 inches high. It is capable of digging a trench from 8 to 12 feet in depth and from 18 to 30 inches in width. The high

traction speed is $1\frac{1}{2}$ miles per hour and the excavation speed from 6 inches to 5 feet per minute.

The 12-foot wheel-base permits the machine to be readily maneuvered in confined areas where larger sizes would be slow and cumbersome.

Construction Mixer Used for Bituminous Road Material

Simpson Brothers Corporation, Boston, Mass., Uses 14-S Construction Mixer for Asphalt Road Work



A 14-S CONSTRUCTION MIXER USED BY SIMPSON BROTHERS CORPORATION, BOSTON, MASS., FOR MIXING BITUMINOUS ROAD MATERIAL WITH GREAT SUCCESS AND SATISFACTION TO THE OWNERS

MANUFACTURERS of concrete mixers are naturally a little backward in recommending the use of a construction mixer for mixing bituminous paving material. As early as 1921 the late John Simpson, President of Simpson Brothers Corporation, Boston, Mass., made inquiries regarding the use of a 14-S construction mixer for this kind of work. Some doubt was expressed as to the usefulness of the machine, for fear that the asphalt would congeal on the blades and buckets.

Simpson Brothers Corporation went ahead, using a 14-S Koehring construction mixer for this work, and it has been used practically continuously on similar materials with very satisfactory results. The material can be mixed much better and a great deal faster than with a cube mixer which this company had been using for four years for this purpose.

According to Clyde R. Dodge, New England Manager of the Koehring Company, the procedure in the use of the mixer for this kind of work is as follows: Every morning the drum is charged with a batch of hot stone. The drum is then revolved with this hot stone for a minute or two, and it soon becomes very warm. The stone is then discharged into a truck and replaced in the heap. Next the hot sand and hot asphalt are admitted into the mixer simultaneously. Almost none of the mixture adheres to the blades and buckets. The only trouble which has been experienced is that the bituminous material sometimes sticks to the discharge chute. This is remedied very simply by the operator's dipping a whisk broom in a pail of kerosene oil and dashing a small quantity of the oil on the discharge chute just before discharging.

Gasoline-Engine-driven Portable Air Compressors

An Outfit Intended Particularly for Rock Removal in Road Building or in City Streets

A GASOLINE-engine-driven portable air-compressor for drilling ledge, block-holding boulders, cutting ditches or trenches for water, sewer or gas mains, or removing old concrete or brick pavements or any rock excavation too scattered or too small in amount at any one location to warrant installing a fixed air power-plant, has recently been brought out by the Sullivan Machinery Company, 122 South Michigan Avenue, Chicago, Ill. This machine will operate riveting tools, air hoists, sand-blast, pumps, clay spaders and like machinery, thus extending its field to steel construction, calking gas mains and to almost any task requiring small quantities of air power at scattered points for a short time. The WK-31 compressor consists of a 150-foot, 2-cylinder, vertical, single-stage, single-acting, air-compressor with hopper water-jacket, operated through gear and pinion by a Buda 4-cycle, 4-cylinder, gasoline engine and mounted with air receiver, gasoline tank, and radiator on a substantial steel truck adapted for horse haulage. This outfit provides ample air capacity for the operation of two standard Rotator hammer drills for all classes of drilling required in road construction or light quarry work.

The compressor is designed especially for this service. The crank-shafts and connecting rods are of steel. The shaft and crank-pin boxes are die-cast of high-grade white bear-



PORTABLE COMPRESSOR,
BELTED TO A TRACTOR

ing metal. The cylinders are surrounded by an open or hopper-type water-jacket, which can be filled with water from a bucket as required. Lubrication is secured by a force-feed oil pump enclosed in the crank-case and



PORTABLE AIR COMPRESSOR AND ROTATOR DRILL ON VIRGINIA ROAD JOB

arranged to deliver oil under pressure to all bearings.

The air valves are of the improved Sullivan "Wafer" plate type characterized by low clearance losses, by quiet action and freedom from wear and breakage. To maintain a constant air pressure, these compressors are provided with an unloading appliance which automatically interrupts the compression of air when the desired pressure is reached. This appliance maintains the air pressure within 5 pounds of the desired amount by raising the inlet valves from their seats, so that the air entering the cylinder on the suction stroke is expelled through the open inlet valves on the return-stroke. The valves are raised by the application of air pressure to small pistons, the air for this purpose being supplied by a small pilot valve, which automatically admits air under pressure from the receiver underneath these pistons whenever the receiver pressure exceeds that for which the pilot valve is set.

The air receiver is mounted on the end of the truck next to the compressor and is good for a working pressure of 110 pounds to the square inch. It is equipped with pressure-gage,

safety-valve, drain-cock and outlet on each side, provided with globe valves for hose connections.

The compressor and engine are mounted on a truck body made up of heavy channel iron strongly braced. The axles are made of double channel iron. The front wheels are 32 inches in diameter and the rear wheels 36 inches. The track gage is 4 feet 8 inches. The rear axle is heavily braced to the truck body, and the front axle is furnished with a heavy fifth wheel and swivel bolster which will enable the truck to travel over rough roads without producing twisting strains on the truck body. A hand brake engages the rear wheels, and for haulage by horses a pole with neck yoke, single tree and double trees is furnished.

The entire outfit is protected from the weather by a strongly braced top supported on the truck frame and equipped with canvas side roller curtains. The equipment of the compressor includes one set of wrenches for repair and adjustment of the engine and compressor, one extra set of compressor valves and valve springs, one extra set of spark plugs, and one tool-box with hinge cover and padlock.

A Dump Body of 60 Cubic Feet Capacity

Body with Hinged Sides Has Large Capacity for Small Truck

THE ash and rubbish body illustrated below has a capacity of 60 cubic feet. It is fitted with hinged sides which are held in place with special lugs. The over-all height of the body is 28 inches, and the sides are hinged 18 inches from the bottom, so that when the upper section is turned down, the ashes, cinders, rubbish, sand or whatever may be carried is easily dumped over the sides. The tail-gate is double-acting and can be suspended level with the floor of the body. The body is

equipped with the new Heil hand hoist, which gives a dumping angle of 55 degrees. This is sufficient to dump out the stickiest kind of material. The longitudinal seam of the body is welded so that it is water-proof.

The Heil Company, Milwaukee, Wis., makes these ash and rubbish bodies, which can be used for other service, being interchangeable with sprinkler tanks having a capacity of about 550 gallons, making the truck available for various collection services as well as for sprinkling.



A HANDY DUMP BODY FOR LIGHT TRUCKS



Equal to Every Emergency

Severe operating conditions emphasize the difference between the "Caterpillar" Tractor and every other machine or method. "Caterpillar" performance, dependability, economy and service are endorsed by the most experienced road officials, contractors and engineers in every country.*

H. N. Rodgers & Co., prominent contractors of Memphis, say:

"We are very glad to advise you at this time of the satisfactory performance of the "Caterpillar" tractors which we have operated under severe conditions in levee contracting work. We have three 10-tons and are glad to say these tractors have met every demand made on them for power, traction and continuous hard work.

For all classes of contracting work, we

prefer the Holt "Caterpillar" because we have found it equal to every emergency, economical to operate and to maintain and particularly because of the very prompt and liberal service which we have received. The matter of prompt and adequate service is most important to the contractor and we have found Holt service to be unequalled and at all times satisfactory to us."

* There is but one "Caterpillar"—Holt builds it

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Traction Wheel Mountings for Railroad Type Steam Shovels

First Instance of Application of Traction Wheels to the Heaviest Type of Steam Shovels

RECENTLY traction wheel mountings have been built and successfully tested on the heaviest railroad type steam shovels. The Osgood 120 shovel with 6-cubic-yard dipper is the largest railroad type machine built and heretofore has been mounted only on standard railroad trucks by the Osgood Company, Marion, Ohio. Because of the time consumed in laying track for moving the shovels, railroad mountings were slow in getting from one point to another. This size shovel is much used in big rock quarries and open mines, and usually when blasting operations were in progress it was necessary to lay track and move the shovel back from the

engine on the shovel. Steering is accomplished by turning the rear wheels by means of a screw shaft and traveling nut. The nut, to which is attached the axle tongue, moves along the screw shaft, slewing the rear axle and wheels in the direction desired. The screw shaft is operated by a separate reversible steering engine, mounted above deck alongside the boiler, out of the way, yet readily accessible. Reversing the engine causes the traveling nut to move in the opposite direction. The engine is controlled and steering accomplished by means of a single lever from the engineer's position at the forward end of the cab.

In recent tests made in a large Pennsylvania



RAILROAD TYPE STEAM SHOVEL EQUIPPED WITH TRACTION WHEELS SIX FEET IN DIAMETER

face of the excavation and then up again after the explosion had been set off. These operations were not only costly in time and labor consumed in making the changes, but also in decreased output through time lost, so that steps were taken to overcome the difficulty.

Giant traction wheels measuring 6 feet in diameter and having a face of 36 inches on the front drive wheel and 30 inches on the rear wheel were designed. The front wheels are used as drivers. Power is delivered through a series of gearing from the powerful hoisting

stone quarry the shovel was moved a distance in one day that under old track-laying methods would have required at least ten days. The traction mountings are expected to revolutionize the use of large railroad type steam shovels in solid-bottom quarries, mines, etc., where their use will be more practical than other types of mountings because of their simplicity. The traction wheels also eliminate the necessity of pit men and the use of jack-arms. These items alone are a great saving in cost and time in moving the shovel forward to the



Powerful Crowding Motion

One reason for the tremendous power and digging capacity of the P & H Gasoline or Electric Shovel is the real crowding motion—the dipper is forced to bite into the hardest soils or rocks by means of a manganese steel rack and pinion actuated by a heavy steel thimble-roller chain driven from a set of planetary gears.

The simplicity and ruggedness of this mechanism are reasons for long life—troubles with cables or other improvised crowding mechanism are eliminated.

Available as required for each motion—hoisting, crowding, and traveling, is the whole energy of the powerful gas or electric motor with its flywheel effect.

The machine is strictly one-man operated and is ready for action at the twist of the crank. No extra working time is spent in getting ready for firing up or for banking fires when work is over—no fuel or water hauling expense.

The real economy and bulldog tenacity make the P & H Shovel, the shovel of today.

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- Easily Converted Into Crane or Skimmer.*
- Long Life due to superior construction.*
- Backed by 38 years of high grade machine building.*

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GASOLINE SHOVEL

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face of the work.

The advantages of traction wheels over railroad trucks for large railroad type steam shovels are claimed by the Osgood Company to be greater mobility of machine; elimination of pit crew; easier accessibility to face of excavation; elimination of tracks and reduction of side strains and racking to the machine in general. Traction wheels are also claimed to have a decided advantage over any other type of mounting in that the wheels are much less complicated, are simple to operate, and have a much lower up-keep cost.

Some idea of the size of the shovel can be gathered from the following figures. It has an over-all length of more than 85 feet, and an over-all width of 20 feet, with a maximum height over the cab of 15 feet, while the boom extends to a height of 32 feet.

A large stone company near Chicago has just installed an Osgood 73, a $3\frac{1}{2}$ -cubic-yard traction shovel, for use in the quarry. The pit is about 80 feet deep and is reached by a very steep incline. To get the new machine

into the pit would ordinarily be quite a problem, but when the machine was equipped with traction wheels the problem was much simplified. With boom up and dipper and handle in place, the shovel was backed down the steep slope under its own power without difficulty. Shortly after this shovel had been placed in operation, a cut of loaded dump-cars was derailed at some distance from the shovel and on the way to the incline hoist. The shovel was thrown into gear and run down to the cars, and a chain was hooked over the dipper teeth and around the cars. In a few minutes the train was rerailed and on its way to the hoist, while the shovel went back to the rock face ready for work. It would have been necessary to unload the cars to rerail them by hand and then reload them. While this was being done, the shovel and other cars would have been standing idle if the ready mobility of the shovel had not saved the day. The shovel has also been used around the quarry for handling boilers and other heavy machinery that ordinarily would require the services of a locomotive crane.

A Combined Scarifier, Grader and 10-Ton Roller

New Machine Shows Great Possibilities for Simplifying Maintenance Work

IN an effort to solve the problem of street and road maintenance, the Gray Tractor Company, Inc., Minneapolis, Minn., has designed the Gray Giant Combination, which consists of a heavy-duty power unit, a scarifier, a standard grader unit, and an 8-ton roller. This machine operates on the principle that good maintenance, regardless of the kind of material, involves three steps which must be thoroughly accomplished: first, the reduction of all material to a workable condition for a depth of several inches; second, the further breaking up of material to give uniformity, then grading it into place in the same operation, leaving the material evenly distributed and the road or street reshaped; third, rolling the road or street to compress the bed and harden the surface that it may withstand the action of traffic and weather.

It is believed that the maintaining of roads

with this machine will not have to be repeated as often as scraping or dragging, as two steps are added to the usual process, namely, scarifying and rolling.

The speed with which the machine completes its work is only a relative matter. Much depends upon the character and condition of the street or road itself. In many cases the original scarifying and the grading can be completed in the same trip, leaving only the rolling to follow. Where each step is taken separately, however, the work proceeds at an average rate of three-quarters of a mile of finished road or street per day.

One operator handles the tractor and the scarifier. The grader unit, which is a standard unit with a short blade, is operated by a second man. It is possible to operate this machine between street car tracks, which greatly increases its field of service.



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Adams Grader, with Back-Sloper attachment, building a flat-bottom, back-sloped ditch.

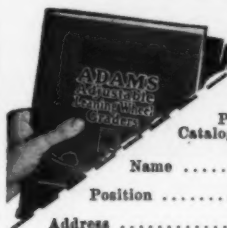
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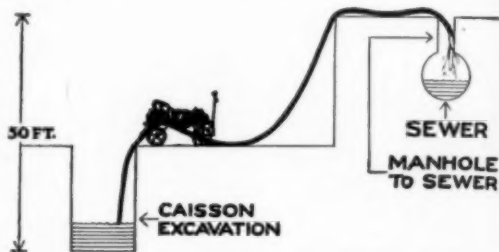
THE Humdinger diaphragm trench and caisson pump illustrated below will draw water 20 feet vertically and in addition will force the water 30 feet vertically, making a total lift of 50 feet per unit, as compared with the 20-foot suction lift of the old-style open-diaphragm pump. This is made possible by the special closed discharge outlet.

The Ralph B. Carter Company, 152 Chambers Street, New York City, manufacturer of this pump, claims that it combines all the advantages of the old-style diaphragm with the ability of a force pump mentioned above.

The closed discharge outlet also makes it possible to deliver the water away from the pump, thus avoiding puddles where the men are working. For handling liquids either light or heavy, containing sand, gravel or short sticks, the ball valve has been found very satisfactory. The ball valves used in this diaphragm pump are made of a specially vulcanized rubber composition just soft enough to seat tightly and hard enough to wear well.

The engine for this pump is operated either by gasoline or kerosene without any change whatsoever. When gasoline is used as a fuel, it is placed in the main fuel tank, and when kerosene is used, a small auxiliary reservoir is filled with gasoline for starting purposes only and the main fuel tank is filled with kerosene.

While rubber ball valves of all known types are least liable to become clogged, the manu-

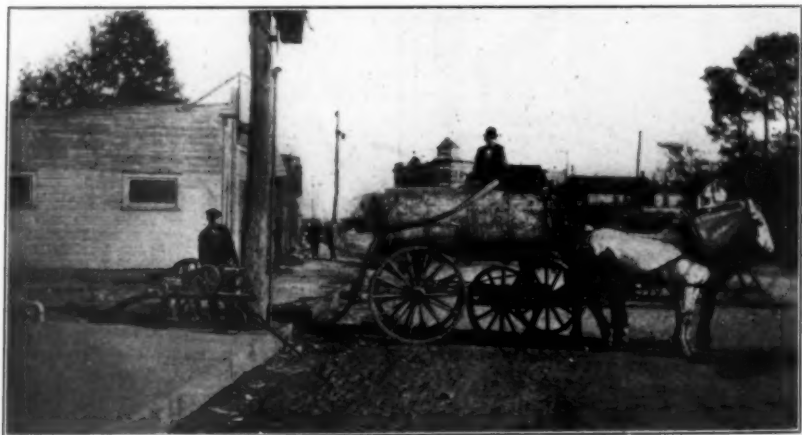


THIS IS HOW THE HUMDINGER RAISES WATER 50 FEET

facturers realize the desirability of having these valves placed so that they are readily accessible without removing any pipe, fittings or hose or disconnecting any of the moving parts or other mechanism of the pump. A hand wheel and yoke hold a cap or cover over the valve chamber, making it easy to open it for examination.

Transferred from Atlanta to New York

The Western Wheeled Scraper Company, Aurora, Ill., has announced the transfer of W. G. Sharretts from the Atlanta territory, to take charge of the New York office of the company, Room 1176, 50 Church Street. Mr. Henderson, who is now in California on a brief vacation, expects to return to New York to assist Mr. Sharretts, who is well known among dirt-movers for his broad fund of knowledge of earth-moving equipment and machinery.



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The "Subber"---A Construction Implement

Equipment Designed for Farming Finds Wide Service in Preparing Ground for Excavating

MANY times implements or equipment designed for a definite purpose have been found to apply to even better advantage to a kind of work never thought of by the original maker. Take "Subbers" for example. These implements were primarily designed and constructed for the arduous work of breaking impervious subsoil strata. The multiple subbers were intended for the deeper tillage of impervious soils which did not of necessity have hard-pan underlying them, but which profited by a deep cultural method that would

Calif., another such subber has been effectively used on road construction in making cuts for the scrapers to carry away.

There is a logical reason for the adoption of subbers in engineering and general contracting. Wide usage of this equipment showed that it would break up more ground to a workable depth in a given time than any other method. Since these subbers materially cut down the costs and conserve the time elements, they are often a deciding factor in the successful completion of a contract.



USING THE AGRICULTURAL SUBBER FOR BREAKING GROUND ON THE MERCED IRRIGATION DISTRICT CANAL, NORTHEAST OF PLANADA, CALIF.

open them to air, light and moisture, but that would not turn the under-soil to the surface. These implements were originated for better farming.

Their usefulness has extended much further. Some far-sighted contractor or engineer, alert to the general developments of the times, saw the merits in the chisel-pointed subbers for breaking the ground for many types of excavating. Now these implements are among the standard equipment of all big outfits.

Bates & Borland, the contractors who are erecting the University Stadium at Berkeley, Calif., are using a big three-pointer to break up the ground for a string of wheel scrapers. The Merced Irrigation District in California is using nine-point subbers to cut the bottoms in the canals so that the earth is readily available for Fresno scrapers. There are three "Sixty" tractors made by the C. L. Best Tractor Company, San Leandro, Calif., equipped with these nine-point subbers keeping 120 mules busy on the fresnos. Back of Ukiah,

Build for Service

A PASSER-BY in one of the devastated villages in France was resting by the wayside, when an old woman, trundling a wheelbarrow, came in view. Upon the wheelbarrow was a large building-stone of the type which one sees in the ancient French houses.

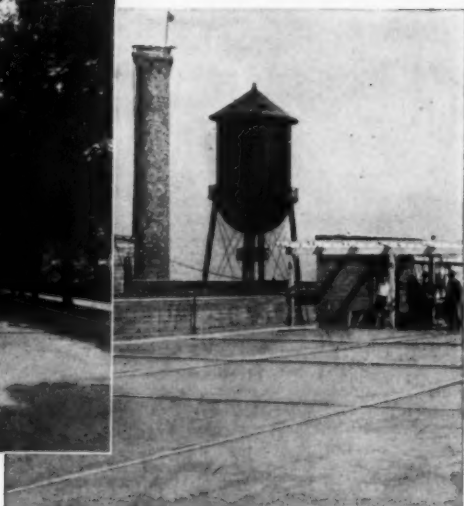
The old woman stopped to rest, and the passer-by, in curiosity, asked the reason for her toil. She replied that her husband and she were rebuilding their home, which had been war-shattered, and that these were stones obtainable from one of the municipal buildings which had also been destroyed.

"But, madame," exclaimed the traveler, "why do you not make use of the small bricks that the Restoration Committee provide for you, instead of wearing yourself out transporting these great stones?"

"Monsieur," she replied, "we build not for a few years to come, but instead, for the generations to come!"—*The Right Angle.*

Left — Concrete floor, Lunkenheimer Co., Cincinnati, O. Elastite Expansion Joint used.

Center — Street in South Nyack, N. Y., Cornelius Vanderbilt General Contracting Co., Inc. Elastite Expansion Joints every 50 feet.



Concrete roof deck, United Drug Co., St. Louis, Mo., Engineers, Harry M. Hope Eng. Co., Boston, Mass., Contractors, Westlake Construction Co., St. Louis, Mo.

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ROOF decks need protection against expansion, building vibration, and exposure. Roads need protection against expansion, traffic impact and exposure. Floors need protection against expansion, machinery and building vibration, and the shocks of heavy trucking.

Elastite Expansion Joint makes these stresses harmless, because each joint resiliently cushions the structural units against shock and vibration, absorbs expansion, and forms a water-tight seal between abutting units, preventing water-soaking of surfaces exposed to weather.

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How Elastite Expansion Joint is water-tight

Elastite Expansion Joint yields easily to compression as concrete or brick expands, and expands as the abutting construction contracts, thereby insuring at all times a tight closure. It prevents the development of openings which fill with dirt or water, and allow frost action to cause heaving and cracking.



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Specifications for Metal Lath Construction

Based on Weight These Specifications Insure Competition

NEW specifications covering the quality of materials and methods of application of all types of metal lath expanded from sheets have been prepared and approved by the Associated Metal Lath Manufacturers and the American Specifications Institute, for wood stud and joint construction, back plastered metal lath stucco construction, stucco on metal lath over sheathing, overcoating stucco on metal lath, metal stud partitions, solid or hollow, for fire-proof buildings and non-fire-proof buildings, wall furring, standard furring, attached ceilings, with steel floor beams, attached ceilings under concrete with removable forms, attached to concrete ceilings with permanent forms, suspended ceilings, beams and cornices, columns and pilasters, corner and jamb reinforcement in block partition construction, metal lath in steel joint construction, and alternate specifications for maximum economy.

Special attention is called to the fact that these specifications, which may be secured from the Associated Metal Lath Manufacturers, 123 West Madison Street, Chicago, Ill., are written upon the basis of weight only, which alone would insure quality of competition through basic cost and facilities for accurate inspection in the field. This is the method adopted at the public conference held by the United States Department of Commerce, through its Bureau of Standards, and also in the American Concrete Institute Stucco Report. Among other

advantages to the architect, this system has reduced the 73 or more different styles, weights, gages and combinations of lath which the architect and contractor needs to be familiar with, to only ten different weights, distributed among expanded metal lath, flat rib lath, and $\frac{1}{4}$ -inch rib lath.

These specifications are approved by the American Specification Institute and are the combined results of many months of investigations into the specifications of leading architects, inspection of actual construction in all parts of the country, research into scores of building codes, and circulating questionnaires among contractors, and comprise the views of the competing manufacturers.

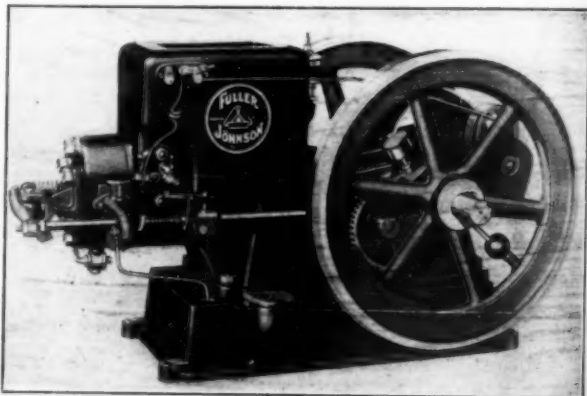
Any specification taken from this compilation will insure not only safe and permanent construction with economical costs, but will establish a basis for maximum competition among all manufacturers of expanded metal lath. They have been specifically approved by the Berger Manufacturing Company, Canton, Ohio; General Fireproofing Company, Youngstown, Ohio; Milwaukee Corrugating Company, Milwaukee, Wis.; Northwestern Expanded Metal Company, Chicago, Ill.; Penn Metal Company, Boston, Mass.; Sykes Metal Lath and Roofing Company, Niles, Ohio; Truscon Steel Company, Youngstown, Ohio, and Youngstown Pressed Steel Company, Warren, Ohio.

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A NEW $2\frac{1}{2}$ horse-power gas engine which embodies many improvements and refinements that add to its durability and efficiency, as well as to the operator's convenience, has been brought out by the Fuller & Johnson Mfg. Company, Madison, Wis.

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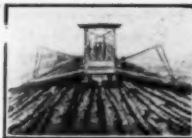
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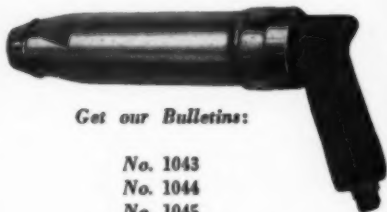
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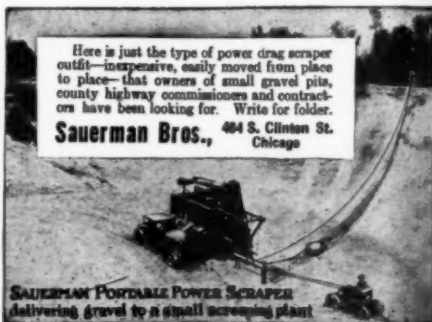
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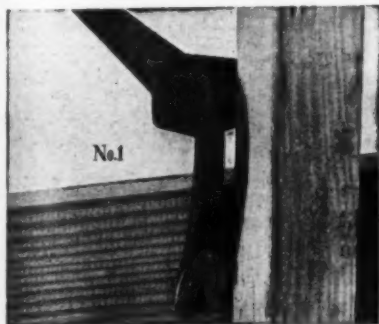
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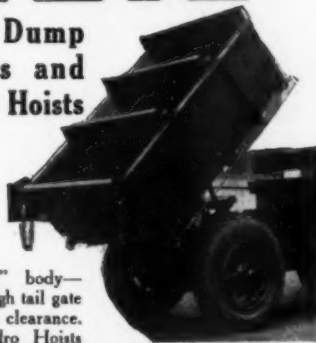


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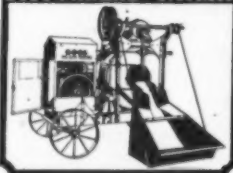
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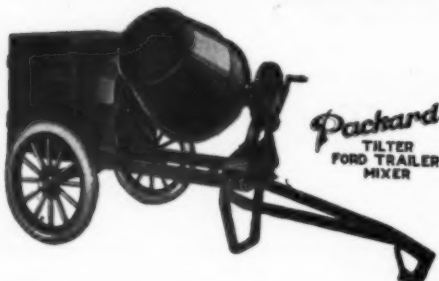
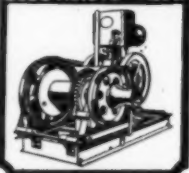
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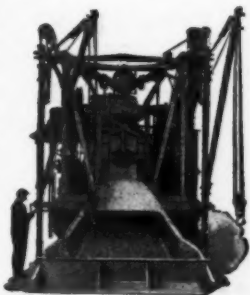
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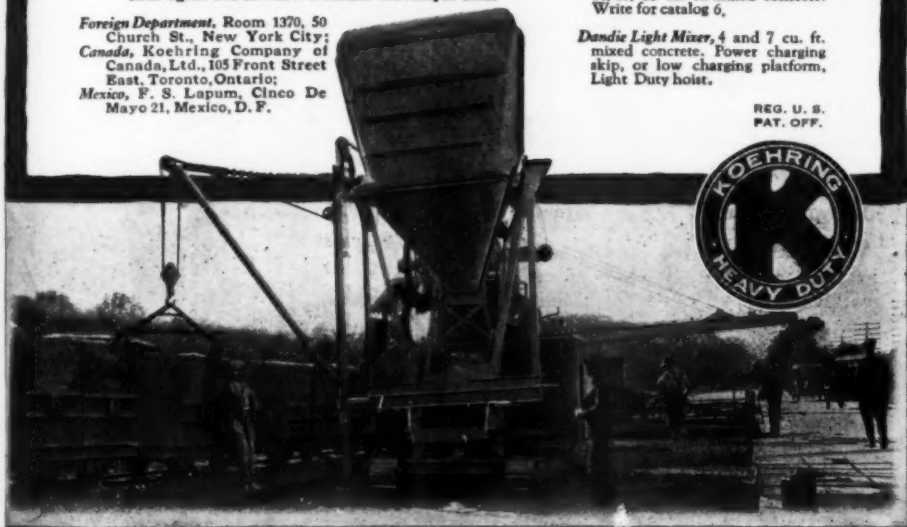
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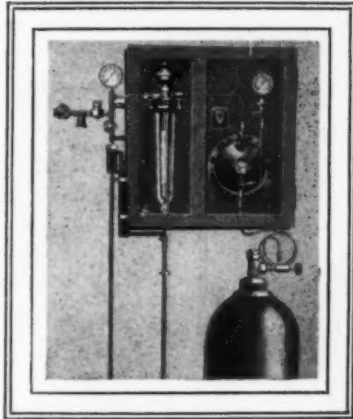
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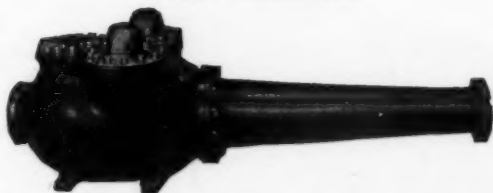


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